BASELINE

COPY

PRELIMINARY ENDANGERMENT ASSESSMENT

APRIL 1994

SEVENTH & NATOMA STREETS
San Francisco, California

For:

San Francisco Redevelopment Agency

91315-I0

5900 Hollis Street, Suite D • Emeryville, CA 94608 • (510) 420-8686

BASELINE

ENVIRONMENTAL CONSULTING

20 April 1994
91315-I0

Dr. Ghosh
Department of Toxic Substances Control
Site Mitigation Branch
700 Heinz Avenue, Suite 200
Berkeley, CA 94710

Subject: **Preliminary Endangerment Assessment for Site at Seventh & Natoma Streets, San Francisco**

Dear Mr. Ghosh:

Please find attached the final Preliminary Endangerment Assessment (PEA) report for the Seventh & Natoma Site. We have incorporated your verbal comments from our meeting on 6 April 1994 on the Draft PEA report submitted to the DTSC on 5 April 1994.

As you know, the Seventh & Natoma Site is the last of four sites located in a small area south of Market Street in San Francisco where the San Francisco Redevelopment Agency (SFRA) has undertaken the PEA process. The SFRA submitted the required fee to the DTSC in May 1992 for the review of the PEA reports for all four sites. The PEA reports for the other three sites (1009 Mission Street, 1028 Howard Street, and 241 Sixth Street), including risks assessments, were previously reviewed and approved by the Department. The PEA process for the Seventh & Natoma Site was postponed because development of the Site was later than the others.

We understand that the DTSC will be providing us with written comments on this PEA report by 10 May 1994. BASELINE will respond to those comments within one week of receipt. We further understand that the goal is to complete the PEA process by 31 May 1994.

Please contact us at your convenience if you have any questions on the PEA report.

Sincerely,

Yane Nordhav
Principal

Lydia Huang
P.E. No. 43995

cc: Bill Nakamura, SFRA
Jack Robertson, SFRA
Pam Hollis, SFDPH
David Jarrell, HDNPC

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TABLE OF CONTENTS

		page
EXECUTIVE SUMMARY		v
I.	INTRODUCTION	1
	A. Site Development	2
II.	SITE DESCRIPTION	2
	A. Site Identification	2
	B. Site Maps	4
III.	BACKGROUND	4
IV.	APPARENT PROBLEM	4
V.	ENVIRONMENTAL SETTING	4
	A. Factors Related to Soil Pathways	4
	B. Factors Related to Water Pathways	5
	C. Factors Related to Air Pathways	8
VI.	SAMPLING ACTIVITIES AND RESULTS	9
VII.	HUMAN HEALTH SCREENING EVALUATION	10
	A. Exposure Pathways	11
	B. Chemicals of Concern	11
	C. Lead	13
	D. Chromium VI	13
VIII.	ECOLOGICAL SCREENING EVALUATION	14
IX.	COMMUNITY PROFILE	15
X.	CONCLUSIONS AND RECOMMENDATIONS	15
	A. Conclusions	15
	B. Recommendations	15
XI.	REFERENCES	18

APPENDICES

A: Phase I Site Assessment Report
B: Phase II Site Assessment Report
C: Correspondence with DTSC Regarding Previous PEA Reports
D: Risk Assessment for 1009 Howard Street Site (excerpts from PEA report)
E: Blood Lead Spreadsheets

TABLE OF CONTENTS *(continued)*

FIGURES

1: Regional Location
2: Sample Locations
3: Histogram of Lead Concentration in All Soil Samples
4: Histogram of Lead Concentration in Shallow Soil Samples
5: Histogram of Lead Concentration in Deeper Soil Samples

TABLES

1: Analyses Performed on Soil Samples
2: Summary of Metal Concentration in Soil
3: Summary of Polynuclear Aromatic Hydrocarbon Concentration in Soil
4: Maximum Metal Concentration in Soil Among Four Sites
5: Maximum Polynuclear Aromatic Hydrocarbon Concentration in Soil Among Four Sites
6: Assumptions for Calculating $tHBL_n$ for Selenium
7: Statistics of Lead Concentration in Soil
8: Blood Lead Concentration
9: Slope Factor and Reference Dose for Chromium VI

EXECUTIVE SUMMARY
Preliminary Endangerment Assessment
Seventh & Natoma Site, San Francisco, California

This document is a Preliminary Endangerment Assessment (PEA) report prepared for a site located at the corner of Seventh & Natoma streets in San Francisco (Site). This report was prepared in accordance with the *Preliminary Endangerment Assessment Guidance Manual* issued by the Department of Toxic Substances (DTSC) in January 1994.

The Site is owned by the San Francisco Redevelopment Agency (SFRA) who intends to transfer the property to a developer for construction of a low-income residential building. The Site is currently vacant, unpaved, and secured by fences. The assessor's parcel numbers for the Site are Block 3726, Lots 33, 34, 35, 36, 37, and 37A.

The Seventh & Natoma Site is the last of four sites in the immediate vicinity where the SFRA has had a PEA prepared. The other three sites are located at 1009 Mission Street, 1028 Howard Street, and 241 Sixth Street. The PEAs for the other three sites included risk assessments and have been reviewed and approved by the DTSC.

Site history and characterization reports have been completed for the Seventh & Natoma Site (Appendices A and B). The Site was formally marshlands at the margins of San Francisco Bay. The Site was filled in the late 1800's or early 1900's using sand from dunes and debris. Fill materials at other sites in San Francisco have been found to contain elevated metal and polynuclear aromatic hydrocarbon concentrations. Four borings and three shallow soil samples have been collected from the Site for chemical analysis. One of the near surface samples had a lead concentration (1,290 mg/kg) that exceeded the Total Threshold Limit Concentration for definition of a hazardous waste specified in Title 22 of the California Code of Regulations. One sample collected just below the groundwater table contained a noncarcinogenic polynuclear aromatic hydrocarbon at 0.446 mg/kg.

Statistical calculations were performed on the total lead concentrations found in the soil samples. The shallow soil samples (less than two feet deep) appeared to have significantly higher lead concentrations than the deeper soils. The range of total lead concentrations for five samples from the shallow soils was 9.1 to 1,290 mg/kg, with a 95 percent one-tailed upper confidence limit of 918 mg/kg. The five lead concentrations associated with the deeper soil samples ranged from 4.7 to 7.5 mg/kg, with a 95 percent one-tailed upper confidence limit of 6.7 mg/kg.

The site history, soil contaminants, and level of contamination for all four SFRA sites are similar. The soil at the Seventh & Natoma Site has fewer chemical of concerns and in general, has lower concentrations of potential contaminants than the three other sites. Because health risks associated with the Seventh & Natoma Site are lower than for the three other sites and because risk assessments were performed for those sites, DTSC staff indicated that a risk assessment would not be needed for the Seventh & Natoma Site. To minimize unnecessary effort, portions of the previously completed PEAs were used in this PEA, where applicable, and the recommendations contained in the other three PEAs were also adopted for the Seventh & Natoma PEA with minor modifications.

The problem associated with the Seventh & Natoma Site is potential health hazards from exposure to the shallow soil. The greatest hazard would be associated with the initial construction stage when the shallow soil would be excavated for off-site disposal and the Site would be graded. Current plans would require the excavation of approximately 2,850 cubic yards of soil. The hazard will be effectively mitigated once the entire Site has been capped with a concrete slab, which will completely isolate the soil from construction worker, the public, and future residents.

The entire Site is currently fenced, unpaved, level, and depressed approximately six feet below than the adjacent street level. There is no surface runoff from the Site since the Site is a depression in the ground and flooding is highly unlikely. Residential and commercial buildings are located immediately adjacent to two sides of the Site.

The Site is located within a basin of unconsolidated sediments that is contiguous with San Francisco Bay. The shallow soils at the Site consist of sand and silty sand, with debris at some locations. Groundwater was encountered approximately 14 feet below the adjacent street level. Groundwater flow direction is believed to follow surface topology which gently slopes down towards the southeast to San Francisco Bay, approximately 1.5 miles away. A 25- to 30-foot thick layer of Bay mud was encountered at approximately 30 feet below the ground surface at the Site. The shallow groundwater is not known to be used for any purpose and it is considered to be non-potable because of the high total dissolved solids concentration. In addition, no surface water intakes are located within three miles of the Site.

Fugitive dust emission from the shallow soils would occur during construction and would be dispersed by the prevailing winds. The average annual wind velocity recorded at a nearby weather station is 9.3 miles per hour from the west to northwest directions. The average rainfall in San Francisco is approximately 21 inches, generally occurring in November through March. Air emissions would be prevented once the concrete foundation slab has been completed for the future building.

A human health screening evaluation was performed for this Site based on the site characterization data. The chemicals of concern were chromium (assumed as chromium VI) and lead. Cancer risk and hazard quotient for chromium were calculated; blood lead concentrations for adults and child were also calculated. The results were:

- $Risk_{soil}$ CrVI = 2.9×10^{-5}
- $Hazard_{soil}$ CrVI = 0.11
- $Hazard_{air}$ CrVI = 1.2×10^{-5}
- Blood Lead - Adult (90th percentile)
  - Using Maximum Lead Concentration = 4.0 μg/dl
  - Using 95% One-tailed Upper Confidence Limit = 3.1 μg/dl
  - Using Average Lead Concentration = 2.9 μg/dl

- Blood Lead - Child (90th percentile)

Using Maximum Lead Concentration	=	13 μg/dl
Using 95% One-tailed Upper Confidence Limit	=	7.6 μg/dl
Using Average Lead Concentration	=	6.1 μg/dl

An ecological screening evaluation was not performed for the Site because the Site is not inhabited by wildlife and the potential for the Site to impact removed wildlife habitats was judged to be insignificant.

Public participation for development of the Site would be provided via a public hearing held by the SFRA Commission in conjunction with a representative of the DTSC. The identical meeting notice and mailing list that were used for the other three SFRA sites would also be used for the Seventh & Natoma Site.

This PEA concludes that the contaminants in the soil may pose potential human health risks but that the risks could be effectively mitigated by implementing the following recommendations (Further Actions Required):

- Soil excavated from the Site should be disposed of at an appropriately permitted facility.
- A health and safety plan should be developed prior to the beginning of construction activities and implemented during construction to protect construction workers and the public.
- A concrete slab and geomembrane should cover the entire Site to effectively isolate the remaining soils from future Site occupants.
- All landscaped areas should be built above the concrete slab and clean soil should be imported for the plant containers.
- A deed restriction should be placed on the Site, which would inform future owners of potential contaminants in the soil. In addition, a building management plan for future maintenance of the concrete slab and geomembrane should be developed to ensure the continued isolation of the soil from occupants and to protect future worker health and safety.

PRELIMINARY ENDANGERMENT ASSESSMENT REPORT
Seventh & Natoma Streets
San Francisco, California

I. INTRODUCTION

This documents is a Preliminary Endangerment Assessment (PEA) report for the land parcels located at Seventh & Natoma streets (Site) in San Francisco (Figure 1), and has been prepared by BASELINE Environmental Consulting for the San Francisco Redevelopment Agency (SFRA). This PEA has been prepared in accordance with the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) Preliminary Endangerment Assessment Guidance Manual, dated January 1994, as well as directions from DTSC staff.

The Site is currently vacant. The SFRA intends to transfer the property to a developer who will construct a low-income rental residential building. Site histories and site characterization have been completed for the Site by Harding Lawson Associates. These activities are documented in two reports which are included in Appendices A and B of this PEA. This PEA minimizes repetition of information contained in the Phase I and II reports, but refers to those reports in the topics of site history and site characterization.

The Seventh & Natoma Site is the last of four sites owned by the SFRA located south of Market Street that is completing the PEA process. The PEA process has been completed for the three other sites, located at 1009 Mission Street, 241 Sixth Street, and 1028 Howard Street. These three sites are all located within a 1,500-foot radius of the Seventh & Natoma Site. The original intent was for all four sites to undergo the PEA process at the same time and therefore fees for DTSC to review the PEA reports for all four sites were submitted to the DTSC on 15 May 1992. However, the schedule for developing the Seventh & Natoma Site was delayed and therefore the preparation of a PEA report was postponed. Draft PEA reports, dated 18 August 1992, for the other three sites were prepared by Harding Lawson Associates (HLA) and submitted to DTSC. Each PEA report contained a risk assessments for the corresponding site. In letters dated 12 November 1992 and 25 May 1993, DTSC indicated that the PEA reports for the other three sites were considered complete. Letters documenting DTSC's review and approval of the PEA reports and HLA's responses to DTSC comments are included in Appendix C of this document for reference.

DTSC staff has verbally directed the SFRA to minimize redundant efforts in the preparation of the PEA for the Seventh & Natoma Site because the Site is so similar to the other three SFRA sites and the PEA reports for the other three sites have already been thoroughly reviewed and approved by the DTSC. The Seventh & Natoma Site and the other three SFRA sites are similar in the following ways:

- All four sites were reclaimed from marshlands in the late 1800's or early 1900's by placement of fill.

- The shallow soils at all four sites consisted primarily of a brown sand with silt or a brown silty sand, indicating that the sources of fill materials placed at the four sites were similar if not the same.
- The chemicals of concern identified at the four sites were the similar and were all associated with the fill.

The Seventh & Natoma Site has fewer chemicals of concern and lower concentrations of contaminants than any of the other three SFRA sites. Therefore, it is reasonable to assume that the risks assessments performed for the other three sites reflect scenarios with higher hazards than those present at the Seventh & Natoma Site. Secondly, the recommendations for future actions specified in the PEA reports for the other three sites were accepted by the DTSC as effective mitigation. Therefore, it is also reasonable to infer that recommendations similar to those made for the other three sites would be sufficient mitigation for the Seventh & Natoma Site. This PEA report recommends the same mitigation measures for the Seventh & Natoma Site as for the other three SFRA sites, with minor modifications.

Since the site history, the contaminants, and the concentrations of contaminants in the subsurface found at the Site and the other three sites are similar, portions of this PEA will directly quote the portions of the previous PEAs that are applicable. The portions transferred from previous PEAs will be contained in quotation marks, followed by an exact reference for the source.

I.A Site Development

The developer plans to construct a four- and five-story residential building on the Site. Soil excavation will be required across the entire Site. In general, approximately six to seven feet of soil will be removed. Additional excavation will be required for pile caps and predrilling will be required for pile installation. The volume of soil that would require off-site disposal is currently estimated to be approximately 2,850 cubic yards.

The building foundation will consist of driven concrete piles with pile caps and a concrete slab that extends across the entire Site. A geomembrane will be installed underneath the concrete slab.

After the completion of the concrete slab, all remaining soil at the Site would be effectively isolated from construction workers and future residents. An open space area will be constructed above the lowest level (underground garage) in southeast corner of the lot. All soil used for landscaping in the area will be imported clean soil.

II. SITE DESCRIPTION

II.A Site Identification

1) **Site Name.**

Seventh & Natoma Site

2) **Contact Person.**

William Nakamura, San Francisco Redevelopment Agency

3) **Site Address.**

Northwest corner of block surrounded by Seventh, Natoma, Sixth, and Howard streets, San Francisco, California

4) **Mailing Address.**

San Francisco Redevelopment Agency, 770 Golden Gate Avenue, San Francisco, California 94102.

5) **Phone Number.**

(415) 749-2400.

6) **Other Names for the Site.**

None.

7) **EPA Identification Number.**

None.

8) **CalSites Database Number.**

None.

9) **Assessor's Parcel Number and Maps.**

City of San Francisco - Block 3726, Lot Numbers 33, 34, 35, 36, 37, and 37A.

10) **Township, Range, Section, and Meridian.**

Tier and Range are T2S and R5W based on the Mount Diablo Meridian, respectively. Approximately longitude and latitude are 122°24'30" and 37°46'45", respectively.

11) **Land Use and Zoning.**

Three lots facing Seventh Street are zoned for mixed use; three lots facing Natoma Street are zoned for residential use.

II.B Site Maps

Site Maps are provided in Figures 1 and 2.

III. BACKGROUND

Site history and hazardous substances/waste management information are contained in the report titled, *Phase I Preliminary Hazardous Materials Site Assessment, Seventh & Natoma Streets, San Francisco, California,* prepared by Harding Lawson Associates, dated 3 January 1991. This report is included in Appendix A.

IV. APPARENT PROBLEM

"Hazardous materials problems associated with the site include elevated concentrations of. . .lead. . . in the fill beneath the site. Problems that may be encountered during and after construction of the proposed development are related to 1) health and safety issues associated with the disturbance of soil during construction, and 2) long-term adverse health concerns that may affect future residents." (pp. 5-6, HLA, 1993a)

V. ENVIRONMENTAL SETTING

V.A Factors Related to Soil Pathways

1) Describe the topography of the site and the surrounding areas.

The entire Site is level and is approximately six feet lower than the adjacent sidewalks. The surrounding area has a gradual slope in a southeasterly direction towards San Francisco Bay.

2) Describe any evidence of environmental impacts from a release at the site.

Evidence of environmental impacts from a release was not observed at the time of the Phase I site assessment inspection (HLA, 1991a).

3) Describe the predominant soil groups for the site.

The shallow soil at the Site consist of fill materials that were placed in the late 1800's and early 1900's. Fill encountered in borings drilled at the Site consisted of sand and silty sand, interbedded with debris at some locations. A three-foot layer of peat was encountered in one boring.

4) Describe the surface slope at the site.

The Site is level and depressed below the adjacent sidewalks.

5) **Describe accessibility to the site in terms of both natural and man-made features or structures which currently restrict human access to the site.**

There is currently no access to the Site. The Site is fenced along Seventh and Natoma streets, and is bordered on the other two sides by buildings and short sections of fences associated with these buildings. In addition, the Site is depressed approximately six feet below the adjacent sidewalks.

6) **Describe any measures which have been taken to contain or prevent direct contact with hazardous substances/wastes in or on the soil at the site.**

Since there is no access to the Site, direct contact with the soil is prevented.

7) **Provide the distance and location to the nearest residential area, school, business, day care center, nursing home, senior citizen community, or hospital.**

Residential building are immediately adjacent to the Site. Four schools are located within a one-half mile radius of the Site, and four schools are located between one-half and one mile from the Site in all compass directions. Five hospitals were identified at approximately one and a half miles from the Site in the northwestern, western and southern directions.

V.B Factors Related to Water Pathways

1) **Describe the hydrogeology beneath the site in terms of known aquifers, depth to aquifers, hydraulic conductivities, confining layers, discontinuities, aquifer interconnections, and any of the features of significance.**

The Site is located within a basin of unconsolidated sediments that is contiguous with San Francisco Bay. The groundwater basin spans all of northeastern San Francisco and is bordered on the west and south sides by bedrock. Groundwater was encountered approximately eight feet below the adjacent ground surface in three borings drilled at the Site. Based on the surface topography in the vicinity, groundwater is expected to flow in a southeasterly direction towards San Francisco Bay. The shallowest water bearing layer is the fill. The fill is underlain by Bay mud. Borings drilled at the Site encountered a 25- to 30-foot thick layer of Bay mud at a depth of approximately 30 feet below the ground surface. The Bay mud generally has low permeability and may retard vertical migration of groundwater downward to the underlying unconsolidated sediments.

2) **Identify the aquifers which have been contaminated by a release from the site, or which are threatened to be contaminated as a result of mitigation of hazardous substances/wastes from a release at the site. Identify any aquifers which are interconnected with an aquifer that has been contaminated by a release from the site.**

Groundwater has not been demonstrated to be contaminated by a release from the Site. Since the source of potential groundwater contamination is the fill, and fill was placed throughout a large area of the City, it would be impossible to identify any potential groundwater impacts from the Site.

3) **For each of the aquifers identified above, provide the following information:**

a. *The use(s) of groundwater from wells which draws from the aquifer(s) (eg., drinking water, irrigation, industrial process water, etc.).*

b. *The distances to the nearest well and drinking water well which draw from the aquifer(s).*

"According to U.S. Geological Survey unpublished data, three wells are within one mile of the site. One well at the Old Mint (5th and Mission streets) is not used. The other two wells, at Sansome and Bush streets and Market and Stockton streets, are specified as institutional wells, but the groundwater usage is not specified. No groundwater supply wells are believed to withdraw water from the site.

"Groundwater in the fill areas of San Francisco is generally affected with the same chemical compounds found in the fill soil. In addition, the salinity of the water from area wells as measured by the total dissolved solids concentration (TDS) exceeds the secondary maximum contaminant limit (MCL) of 500 mg/L per state guidelines. Therefore, the groundwater in the fill is not expected to be used for human consumption, landscape irrigation, or agricultural irrigation because of its high salinity.

"In addition, according to State Water Resources Control Board (SWRCB) Resolution No. 88-63, all surface- and groundwaters of the state are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the RWQCB, except for surface and groundwater where:

"• The TDS exceed 3,000 mg/L and is not reasonably expected by RWQCB to supply a public water system.

"• There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be

treated for domestic use using either best management practices or best economically achievable treatment practices.

"The groundwater in the fill would not be considered suitable or potentially suitable for a water supply system because the contaminated fill is widespread throughout the San Francisco waterfront and TDS concentrations have been measured in area wells in excess of 3,000 mg/L. Moreover, the withdrawal of groundwater from the fill aquifer likely would induce settlement of the fill consolidation of the Bay mud, and disruption of buildings and other structures. Groundwater withdrawal from the fill would not be advised for domestic, industrial, or agricultural uses on the basis of engineering principles associated with ground settlement." (pp. 10-11, HLA, 1993a)

c. *The direction and velocity of flow within the aquifer(s).*

Direction of groundwater flow is believed to be to the southeast towards San Francisco Bay, based on local topography.

d. *The approximate number of service connections and population served by drinking water wells from the aquifer(s).*

None known.

4) **Describe the possible migration route(s) from the areas of hazardous substance/waste contamination and/or storage to nearby surface waters, marshlands, wetlands, or critical habitats in the event of surface water runoff or flooding.**

The Site is currently approximately six feet below the adjacent streets. Rainfall remains on the Site. Surface runoff from flooding is highly improbable.

5) **Describe the locations and uses of surface waters, marshlands, wetlands, and critical habitats which may be potentially affected by migration of contaminants from the site. Also, provide the location and distance to the <u>nearest</u> surface water, marshland, wetland, and critical habitat which may be affected by migration of the contaminants.**

The China Basin channel connected to San Francisco Bay is located approximately three-quarter of a mile southeast of the Site (presumed groundwater flow direction). San Francisco Bay provides open water wildlife habitat and is on the Pacific Flyway. Federal endangered species that inhabit the Bay are the California Brown Pelican and the Peregrine Falcon. Groundwater has not been demonstrated to be contaminated at the Site. However, given that the same contaminates are present throughout a large portion of the City (present in fill), it appears likely that the effects of any potential migration of contaminants from the Site to the Bay would be negligible.

6) **Describe any past or existing measures for preventing or mitigating surface water runoff from the site (e.g., berms, diversion systems, diking, sealed containers for hazardous substances/wastes, runoff collection systems, etc.).**

The entire Site is depressed approximately six feet below the adjacent streets. Therefore, there is no surface runoff from the Site.

7) **Identify the approximate population served (number of people drinking water) by <u>each</u> surface water intake within three (stream) miles downstream of the probable point of entry of runoff from a site to a stream/river and one mile from the probable point of entry to a static body of water.**

There are no surface water intakes within three miles of the Site.

8) **Provide the approximate slope of the site and intervening terrain between the site and any surface water which may potentially accept runoff.**

The Site is level and depressed below the adjacent streets. In addition, there is no surface runoff from the Site.

V.C <u>Factors Related to Air Pathways</u>

1) **Describe the known or potential source and mechanism for the release or threatened release.**

The source of potential releases to the air is the fill. The mechanism of release would be dispersion of fugitive dust by wind and by future construction activities. The Site is currently uncovered and is mostly covered by weeds. The vegetation cover currently mitigates potential release by wind action.

2) **Provide the daily prevailing wind direction and daily average velocity for the site.**

The nearest weather station is located in downtown San Francisco. The prevailing wind direction is from the west to northwest; the annual average velocity is 9.3 miles per hour.

3) **Describe the local climatic factors.**

"The average annual rainfall (1931-1960) in San Francisco is 20.78 inches, falling mostly from November through March. Maximum precipitation measured at the Civic Center in 1 hour is 1.07 inches (for the period 1889-1950); maximum for 24 hours is 3.65 inches (Navy, 1984). In the summer, drought conditions exist and precipitation and thunderstorms are exceedingly rare. Summer fog, from late afternoon through the night, is common in many parts of San Francisco.

"The highest temperature recorded in San Francisco is 101°F, the lowest is 27°F. The average high temperatures for January, April, July, and October are 58°F, 65°F, 70°F, and 70°F, respectively. The average low temperatures are approximately 15 degrees lower than the average high temperatures (Schlocker, 1974)." (p.9, HLA, 1993a)

4) **Describe the timing of the release or threatened release.**

Potential release to the air may occur from the vacant Site, but the most significant air releases could occur during the initial stages of construction when the surficial fill would be excavated and the Site graded. There would be no air releases after the basement slab has been placed since all the fill will be covered.

5) **Describe the possible dispersion routes(s) for a release or threatened release.**

Air dispersion may occur anytime prior to the completion of the basement slab. Dispersion routes would be dictated by the wind direction at the time of dust emission.

6) **Provide the approximate population of residents and workers which may be affected by a release or threatened release of hazardous substance/waste;**

The population of residents that may be affected by an air release from the Site has not been defined. The number of workers that may be exposed to the soils on the Site prior to the completion of the concrete slab is estimated to be approximately 20.

7) **Provide the location and distance from the site to any of the following areas which may be impacted by a release or threatened release of hazardous substances: commercial/industrial; national/state parks, forests, wildlife reserves, and residential areas; agricultural lands in production within five years; historic/landmark sites.**

Commercial/industrial and residential areas are adjacent to the Site and may be impacted by air releases from the Site; there are no forests, wildlife preserves, or agricultural lands within five miles of the Site; the Presidio, a proposed national park, is located approximately four miles northwest of the Site (prevailing wind direction is from the west to northwest).

8) **Provide the type, location, and distance from the release or threatened release of hazardous substances to the following sensitive environments: schools, day care centers, hospitals, nursing homes, retirement communities, any other sensitive populations, coastal wetlands, fresh-water wetlands, habitat for special species, national parks.**

See answer to question number 7 in Section V.A.

VI. SAMPLING ACTIVITIES AND RESULTS

Sampling and analysis of the soil have been conducted to characterize the Site. These activities and results are documented in two reports. These reports were prepared by Harding Lawson Associates and are titled, *Phase I Preliminary Hazardous Materials Site Assessment, Seventh & Natoma Streets, San Francisco, California,* dated 3 January 1991, and *Phase II Preliminary Site Assessment, Soil Sampling and Chemical Analysis, Seventh & Natoma Streets, San Francisco, California,* dated 19 February 1991. These reports are included in Appendices A and B of this PEA, and should be referred to for details on the investigations.

The site characterization approach used for the Seventh & Natoma Site was the same as that used for the other three SFRA sites that have completed the PEA process. Since the site characterization was deemed adequate for the other three sites, as inferred by DTSC approval of the other three PEAs, it is reasonable to conclude that the Seventh & Natoma Site has also been adequately characterized.

Three near-surface soil samples and eight subsurface soils from four borings were collected at the Site. The analyses performed on the soil samples are summarized in Table 1; metals and polynuclear aromatic hydrocarbon (PNA) results are summarized in Tables 2 and 3, respectively.

Soil samples have been collected from five of the six lots which make up the Site. Although data from Lot 34 (Figure 2) are not available, the data from the remainder of the Site are believed to be representative of Lot 34 because the lots had similar site histories and contamination was consistently associated with the fill on all the lots sampled. The six lots that make up the Site were occupied by buildings in the year 1887 (p. 4, HLA, 1991a); and the fill encountered in all the borings drilled at the Site consisted of a brown silty sand (Plates 3-6, HLA, 1991b). These facts suggest that the six lots were all filled prior to 1887 with a similar source of material. Since the contamination is found in the fill, and the fill placed on all the lots appear to be the same, it seems likely that the soil quality data from the five lots is also representative of soil on Lot 34.

Only one of the ten samples analyzed for total lead exceeded the Total Threshold Limit Concentration (TTLC). The one sample analyzed for soluble lead by the Waste Extraction Test exceeded the Soluble Threshold Limit Concentration. The sample analyzed for Title 22 metals did not contain any metals in excess of the respective TTLCs. Among the PNAs, only pyrene was identified above laboratory reporting limits in one sample at 0.446 mg/kg. Pyrene is not a carcinogenic chemical.

VII. HUMAN HEALTH SCREENING EVALUATION

Risk assessments were completed as part of the PEA for the SFRA sites located at 1028 Howard Street, 1009 Mission Street, and 241 Sixth Streets in San Francisco. Since the contaminants identified at those three sites and the Seventh & Natoma Site were similar, and concentration of contaminants at the Seventh & Natoma Site is generally lower than the other three sites, only a screening evaluation is presented here for the Seventh & Natoma Site. The contaminants found in the subsurface at the 1009 Mission Street site were the highest observed among the four sites. Excerpts from the 1009 Mission Street PEA are included in Appendix D of this PEA since it presents the risk associated with the highest contamination among the four sites.

VII.A Exposure Pathways

The potential exposure pathways are inhalation of fugitive dust from the Site, dermal contact with the soils, and ingestion of the soil. Exposure from groundwater is not considered for this Site. As discussed in Question 3 in Section V.B, groundwater under the Site brackish and is not a potential potable water source; therefore, there is no potential for ingestion of groundwater. Secondly, the groundwater table is approximately 8 feet below the ground surface and exposure via dermal contact with the groundwater can also be eliminated.

VII.B Chemicals of Concern

The chemicals of concern for the Site were determined primarily by comparing the maximum concentrations observed at the other three SFRA sites where risk assessments were previously performed with those observed at the Seventh & Natoma Site. A chemical was eliminated as a chemical of concern if any of the following conditions were satisfied: (1) a chemical was found below the laboratory reporting limit; or (2) a chemical was not identified as a chemical of concern at the other three sites and the concentration found at the Seventh & Natoma Site was lower than the maximum concentrations observed at any of the other three sites. A chemical was evaluated to determine whether it should be considered a chemical of concern if the concentration found at the Seventh & Natoma Site were higher than the maximum concentration at the three other sites.

Tables 4 and 5 summarize the maximum metal and PNA concentrations identified at the Site and the three other sites. The tables also indicate whether the metals and PNAs were identified to be chemicals of concern in the previously completed risk assessments.

Metals

Among the metals, arsenic, chromium (assumed as chromium VI), thallium, and lead were identified as chemicals of concern at the other three sites where risk assessments were completed. Arsenic and thallium were found above laboratory reporting limit at the three other sites and were not identified above the laboratory reporting limit of 1 mg/kg at the Seventh & Natoma Site. Therefore, arsenic and thallium were not considered chemicals of concern for the Site.

Chromium (assumed as CrVI) was considered a chemical of concern for the Site because the chromium concentration was higher at the Seventh & Natoma Site than those found at the other three sites and chromium was considered a chemical of concern at the other three sites.

Lead was also retained as a chemical of concern because it exceeds 130 mg/kg, which is the maximum concentration that would not require future analysis (DTSC, 1994, p. 2-19).

Antimony and cobalt concentrations at the Seventh & Natoma Site were identified at 3.9 and 6.6 mg/kg, respectively. The highest antimony and cobalt concentrations

observed at the other three sites were 3.8 and 6.4 mg/kg, respectively (241 Sixth Street site). Since antimony and cobalt were not considered chemicals of concern at the 241 Sixth Street site and because the difference in concentrations between the results from the Seventh & Natoma Site and the 241 Sixth Street site are negligible, antimony and cobalt were not considered chemicals of concern for the Seventh & Natoma Site.

Selenium was identified at 3.1 mg/kg at the Seventh & Natoma Site, whereas it was not identified above the laboratory reporting limit of 3 mg/kg at the other three sites. Following procedures used in determining chemicals of concern in the risk assessments performed at the other three sites, a total Health Based Level for noncarcinogens ($tHBL_n$) for residential children was estimated for selenium[1]. The chronic oral reference dose (RfD) for selenium is 0.005 mg/kg-day (EPA, 1994); an inhalation reference dose has not been established. The assumptions used to calculate the $tHBL_n$ is summarized in Table 6 using the following equation:

$$tHBLn = \frac{HQ \ x \ BW \ x \ ATn}{ED1 \ x \ ED2 \ x \ 10^{-6} kg/mg \ x \ \{(IR \ x \ \frac{OAF}{RfD_o}) + (DSA \ x \ SAF \ x \ \frac{DAF}{RfD_o}) + (InR \ x \ RP \ x \ \frac{PAF}{RfD_i})\}}$$

Where:

RfD_i = Inhalation Reference Dose
RfD_o = Oral Reference Dose

The selenium $tHBL_n$ for residential children was calculated to be 279 mg/kg. Since the selenium concentration at the Seventh & Natoma Site was 3.1 mg/kg, well below the $tHBL_n$, selenium was not a chemical of concern.

PNAs

None of the PNA compounds was a chemical of concern at the Seventh & Natoma Site. The only PNA identified at the Seventh & Natoma Site was pyrene at 0.446 mg/kg. Since this concentration is less than the pyrene concentrations found at the other three sites and pyrene was not considered a chemical of concern at the other sites, pyrene is also not considered a chemical of concern at the Seventh & Natoma Site.

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1 The $tHBL_n$ for residential children is lower than for residential adults and construction workers; therefore the $tHBL_n$ for children is most restrictive.

VII.C Lead

Statistical calculations were performed on the lead concentrations associated with soil samples collected from the Site and the results are summarized in Table 7. The data are not normally distributed as evident in the histograms presented in Figures 3, 4, and 5. It appears that the shallow soils samples (collected from two or less feet below the ground surface) had higher lead concentrations than the deeper soils. The range of the five lead concentrations for shallow soils was 9.1 to 1,290 mg/kg, with a 95 percent one-tailed upper confidence limit of 918 mg/kg. The sample with a lead concentration of 1,290 mg/kg appears to be an outlier (Figures 3 and 4). The five lead concentrations associated with deeper soil samples ranged from 4.7 to 7.5 mg/kg, with a 95 percent one-tailed upper confidence limit of 6.7 mg/kg (Figure 5).

The spreadsheet provided by DTSC was used to project blood lead levels for children and adults based on inhalation, ingestion, and dermal absorption of lead associated with the soil at the Seventh & Natoma Site.

The ambient air concentration input was $0.03\mu g/m^3$, which is the average lead concentration measured in San Francisco by the Bay Area Air Quality Management District in 1990 and 1991. The lead concentration in water input was 13 μg/L, based on monitoring of tap water in San Francisco by the San Francisco Water Department in 1992. Plant uptake factor was set to zero (no home-grown vegetables) since the soil will be completely isolated with a concrete slab at the Seventh & Natoma Site. The default value of 50 $\mu g/m^3$ was used for the airborne dust concentration.

Three different soil lead concentrations were input into the spreadsheet: average lead concentration observed in the ten samples collected from the Seventh & Natoma Site (229 mg/kg), the 95 percent one-tailed upper confidence limit for the lead concentrations observed at the Site (462 mg/kg), and maximum lead concentration observed at the Site (1,290 mg/kg). The blood lead concentrations for the three soil lead concentrations input calculated in the spreadsheet are summarized in Table 8 and the spreadsheets are included in Appendix D.

All 99th percentile adult blood lead concentrations calculated based on the three soil lead concentrations were below 10 μg/dl, the level of concern for children and adults as specified in the DTSC guidance materials for the blood lead spreadsheet. The 99th percentile children blood lead concentration assuming an average soil lead concentration was 8.9 μg/dl, also less than the level of concern. However, the 98th and 90th percentile children blood lead concentrations equalled or exceeded the level of concern for lead concentration input of the 95 percent one-tail upper confidence limit and of the maximum lead concentration observed, respectively.

VII.D Chromium VI

The soil sample from the Site was only analyzed for total chromium. Since chromium VI data were not available, the total chromium concentration was assumed to be in the

hexavalent state. It should be noted, however, that it is highly unlikely that the chromium in the soil is in the hexavalent form. $Risk_{soil}$, $Hazard_{soil}$, and $Risk_{air}$ were calculated for chromium VI using the following equations (DTSC, 1994).[2]

$$Risk_{soil} = (SF_o \times C_s \times (1.57 \times 10^{-6})) + (SF_o \times C_s \times (1.87 \times 10^{-5}) \times ABS)$$

$$Hazard_{soil} = ((C_s/RFD_o) \times (1.28 \times 10^{-5})) + ((C_s/RfD_o) \times (1.28 \times 10^{-4}) \times ABS)$$

$$Risk_{air} = SF_i \times C_a \times 0.149$$

$$C_a = C_s \times (5 \times 10^{-8}\ kg/m^3)$$

Where:

SF_o	= oral cancer slope factor, $(mg/kg\text{-}day)^{-1}$
C_s	= concentration in soil, mg/kg
RfD_o	= oral reference dose, mg/kg-day
ABS	= absorption fraction, dimensionless
SF_i	= inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$
C_a	= concentration in air, mg/m^3

The total chromium concentration was 39 mg/kg; the Slope Factors and chronic RfDs for chromium VI are presented in Table 9; and the absorption fraction for chromium VI used in the $Risk_{soil}$ and $Hazard_{soil}$ equations was taken to be zero (Appendix A, DTSC, 1994).

The results from the calculations are as follows:

$Risk_{soil}$	= 2.9×10^{-5}
$Hazard_{soil}$	= 0.11
$Risk_{air}$	= 1.2×10^{-5}

VIII. ECOLOGIC SCREENING EVALUATION

"Under baseline conditions, sensitive, endangered or threatened species identified in the greater San Francisco Bay do not frequent the [Seventh & Natoma] site. This site is not used as a main source of food and shelter for terrestrial or aquatic wildlife. Also, the site is fenced and is in an urban setting. Sensitive avian species do not frequent the site as there is minimal vegetation, and surface

[2] $Hazard_{air}$ cannot be calculated for chromium VI because an inhalation reference dose is not currently available. A reference dose contained in the 1991 version of HEAST was withdrawn in 1992 and has not been replaced with a new value.

water habitats and shelters do not exist at the site. Additionally, the area is not currently part of any park or designated scenic area. Therefore, the site is not expected to pose a threat to wildlife. Any potential impacts to the Bay as a result of groundwater below the site potentially reaching the Bay are considered negligible and a regional problem. . . . Any potential threats to the environment are expected to be reduced and made negligible if the site were encapsulated with a building foundation." (pp. 37-38, HLA, 1993a).

IX. COMMUNITY PROFILE

The land uses around the Seventh & Natoma Site are a mix of residential, commercial, and light industrial occupancies. The public participation activities would be the same as those that were undertaken for the other three SFRA sites that have completed the PEA process. The activities would consist of:

- A notice placed in a local newspaper regarding development of the Seventh & Natoma Site.
- A special public hearing notice sent to interested parties (using the same mailing list as used for the other three sites) announcing a SFRA public hearing to solicit public input on the Site.
- A public hearing of the SFRA Commission in conjunction with a representative(s) of the DTSC to receive public input.

X. CONCLUSIONS AND RECOMMENDATIONS

X.A. Conclusions

"Based on the results of the [baseline risk assessment], one or more of the COCs may present potential health risks assuming baseline conditions at the site depending on the type of exposure scenario assumed in the analysis. Therefore, recommendations to prevent exposures pre-, during, and post-construction of the site, are summarized in [this section]. It is expected that site development based on these recommendations would reduce direct contact exposures to soil to negligible amounts.

"[Lead] concentrations exceeding DTSC hazardous waste criteri[on] have been found throughout fill materials along the margins of San Francisco Bay in San Francisco. The contaminated fill cannot be remediated using cost-effective treatment practices because of the widespread areal extent of the fill layer. However, recommendations for site mitigation. . .if implemented, will minimize any current and future exposures to such human populations as construction workers and residents.

"Since the site is approximately 1.5 miles inland of the bay and the chemicals detected at the site have limited mobility in soil and groundwater, HLA judges the health of the aquatic life of San Francisco Bay would not be adversely affected by the sole presence of chemicals in soil at the site. Additionally, the groundwater in the bay is already degraded by high TDS levels and other constituents from many other sites, some far larger than this site. The

mobility of chemicals would be lessened by encapsulating the site to reduce infiltration of soils by rainwater. . ." (p.45, HLA, 1993a)

X.B Recommendations

This section discusses the Further Actions Required to mitigate the potential hazards associated with the on-site soils. The recommendations are nearly identical to those recommended for the other three SFRA sites that have completed the PEA process. Since the Seventh & Natoma Site represents a lower health hazard than the other three sites, these recommendations should also be adequate for protecting the health and safety of the construction workers, the public, future residents, and the environment from the soil at the Site.

Construction Site Mitigation

". . .the construction site mitigation measures identified in this document [would] remediate any potential health hazard that would be created by construction activities at the site. Portions of this document should be included as part of the construction bid specifications. The contractors will therefore be required to provide the appropriate on-site personnel and equipment needed to implement the site mitigation measures.

"A Health and Safety Plan (HSP) should be written by a certified industrial hygienist [before the beginning of any construction activity] in accordance with accepted industry standards and federal health and safety regulations 40 CFR 1910.120 to be implemented during site development. Based on the risk assessment results, HLA judges that the most likely pathway for human exposure to the chemicals detected at the site would occur when site soils are disturbed during such activities as [soil excavation and general grading]. Therefore, before beginning any earthwork-related construction activities that would disturb on-site soil, workers should be notified of the site conditions and the HSP should be implemented. The HSP should describe the specific personnel, procedures, and equipment that will be used on-site during construction to protect the health and safety of the construction workers and general public from exposure to hazardous substances arising from the soil. The HSP should specify appropriate dust filtering respirators to decrease a construction worker's incidental ingestion, and inhalation of soil. Gloves should be recommended to prevent potential dermal exposures. Hand to mouth contact should be avoided at all times and careful hygiene should be practiced. The HSP should include dust control measures to be implemented during site grading and construction activities. The dust control measures should include moisture-conditioning the soil, using dust suppressants. Air monitoring should be performed to evaluate the amount of airborne particulates of site chemicals during development. Compliance with the HSP during construction should be maintained by a certified industrial hygienist." (pp. 46-47, HLA 1993a)

Soils excavated from the Site should be properly characterized to determine the appropriate waste classification for the soil. The soil should then be disposed of in

accordance with State and Federal regulations at a facility permitted to accept the waste.

Post-Construction Site Mitigation

"To prevent exposure to future site occupants, the on-site soil should be encapsulated beneath a concrete floor slab of the building. This encapsulation would be accomplished by designing a structurally-supported slab connected to the foundation system to cover the entire site. The structurally supported slab mitigates the ground deformations expected during an earthquake in areas of high liquefaction potential (such as this site). The reinforced concrete slab will be supported by grade beams on vertical piles that are set in a competent geologic formation. If the ground beneath the site were to settle in response to seismic activity, the concrete floor would not be expected to settle; therefore, the potential for cracks developing through the thickness of the floor would not be expected to occur. Additionally, the structurally-supported floor slab would be underlain by a vapor barrier and by approximately 6 inches of crushed rock. The vapor barrier would have elastic qualities that would prevent any vapors from chemical-laden soil migrating up through the concrete floor. HLA concludes that the structurally-supported floor slab would provide acceptable protection and isolate the soil from the general public and site residents during the post-development condition of the property.

"Additionally, all landscaped areas should be above the concrete floor slabs (i.e., no root penetration to site soils) and imported fill should be used for the plant containers.

[A deed restriction should be placed on the Site to inform future owners of the presence of the potential contamination.] "A building management plan should be prepared and mandated by the SFRA as part of the property deed to direct appropriate handling of site soils after development. The plan should include procedures to minimize future on-site resident and maintenance workers from contacting chemical-laden soil. The management plan should also include an inspection schedule to identify potential avenues for site soils to reach the basement, such as floor cracks. If site soils are encountered, a hazardous material management plan should be prepared to appropriately handle the soil and prevent the exposures. If the on-site soil is removed during any such subsequent on-site construction activities, it should be dispose of at an appropriate disposal facility.

". . .if the health and safety and mitigative measures identified are followed correctly, . . .the affected soil beneath the site will not result in environmental or human health risks during or after site development." (pp. 47-48, HLA, 1993a)

XI. REFERENCES

Department of the Navy, 1984, *Environmental Impact Statement (Draft), San Francisco Bay Region Homeporting, Treasure Island Naval Station*, San Francisco, California.

Department of Toxic Substances Control, 1992, *California Potency Factors*, Standard and Criteria Work Group, Office of Environmental Health and Hazard Assessment, Sacramento, California.

Department of Toxic Substances Control, 1994, *Preliminary Endangerment Assessment Guidance Manual*, January.

EPA, 1994, Integrated Risk Information System Database, Office of Research and Development, Cincinnati, Ohio.

Harding Lawson Associates, 1991a, *Phase I Preliminary Hazardous Materials Site Assessment, Seventh & Natoma Streets, San Francisco, California*, 3 January.

______, 1991b, *Phase II Preliminary Site Assessment, Soil Sampling and Chemical Analysis, Seventh & Natoma Streets, San Francisco, California*, 19 February.

______, 1993a, *Site Assessment, 1009 Mission Street, San Francisco, California*, Volumes I and II, 28 June.

______, 1993b, *Site Assessment, 1028 Howard Street, San Francisco, California*, Volumes I and II, 28 June.

______, 1993c, *Site Assessment, 241 Sixth Street, San Francisco, California*, Volumes I and II, 28 June.

Schlocker, J., 1974, *Geology of the San Francisco North Quadrangle, California*, Geological Survey Professional Paper 782.

TABLE 1

ANALYSES PERFORMED ON SOIL SAMPLES
Seventh & Natoma Streets, San Francisco, California

Sample/ Boring	Depth (feet bgs)	TPH[1]	Title 22 Metals	Total Lead	Soluble Lead[2]	PNA[3]
SS-1	0.5			✓		✓[4]
SS-2	0.5			✓	✓	✓[4]
SS-3	0.5			✓		✓[4]
B-1	2.0		✓	✓		
B-1	4.5			✓		✓
B-1	9.0	✓		✓		✓
B-2	1.5			✓		
B-2	10	✓				
B-3	6.0	✓		✓		
B-3	10.5	✓		✓		
B-4	4.0	✓		✓		

Notes: bgs = below ground surface
Sample locations shown on Figure 2.

1 TPH = total petroleum hydrocarbons; TPH was not identified above laboratory reporting limits in all five samples.
2 Soluble lead using the Waste Extraction Test.
3 PNA = polynuclear aromatic hydrocarbons.
4 Samples SS-1, SS-2, and SS-3 were composited for PNA analysis.

TABLE 2

SUMMARY OF METAL CONCENTRATION IN SOIL
Seventh & Natoma Streets, San Francisco, California
(mg/kg)

Sample/ Boring	Depth	Date Sampled	Ag	As	Ba	Be	Cd	Co	Cr	Cu	Hg	Mo	Ni	Pb	Sb	Se	Th	V	Zn
SS-1	0.5	12/13/90	--	--	--	--	--	--	--	--	--	--	--	9.1	--	--	--	--	--
SS-2	0.5	12/13/90	--	--	--	--	--	--	--	--	--	--	--	348[1]	--	--	--	--	--
SS-3	0.5	12/13/90	--	--	--	--	--	--	--	--	--	--	--	1,290	--	--	--	--	--
B-1	2	1/14/91	<0.5	<1.0	197	<0.5	1.4	39.0	39.0	80.0	<1.0	<1.0	20.6	274	3.9	3.1	<1.0	20.6	462
B-1	4.5	1/14/91	--	--	--	--	--	--	--	--	--	--	--	5.0	--	--	--	--	--
B-1	9	1/14/91	--	--	--	--	--	--	--	--	--	--	--	4.7	--	--	--	--	--
B-2	1.5	1/14/91	--	--	--	--	--	--	--	--	--	--	--	340	--	--	--	--	--
B-3	6	1/14/91	--	--	--	--	--	--	--	--	--	--	--	5.6	--	--	--	--	--
B-3	10.5	1/14/91	--	--	--	--	--	--	--	--	--	--	--	7.5	--	--	--	--	--
B-4	4.0	1/11/91	--	--	--	--	--	--	--	--	--	--	--	5.5	--	--	--	--	--

Notes: -- = not analyzed.
<x.x = the metal was not detected above the laboratory detection limit of x.x.
Sample locations are shown on Figure 2.
Laboratory reports are contained in the site assessment reports included in Appendices A and B.

[1] WET Lead was also analyzed for this sample, and quantified at 20.8 mg/L.

Sources: HLA, 1991a; HLA, 1991b.

TABLE 3

SUMMARY OF POLYNUCLEAR AROMATIC HYDROCARBON CONCENTRATION IN SOIL
Seventh & Natoma Streets, San Francisco, California
(mg/kg)

PNAs	SS-1, SS-2, SS-3 Composite	B-1 @ 4.5 ft. bgs	B-1 @ 9 ft. bgs
Acenaphthene	<0.14	<0.07	<0.07
Acenaphthylene	<0.14	<0.07	<0.07
Anthracene	<0.14	<0.07	<0.07
Benzo(a)anthracene	<0.14	<0.07	<0.07
Benzo(a)pyrene	<0.28	<0.14	<0.14
Benzo(b)fluoranthene/ Benzo(k)fluoranthene	<0.14	<0.07	<0.07
Benzo(g,h,i)perylene	<0.28	<0.14	<0.14
Chrysene	<0.14	<0.07	<0.07
Dibenzo(a,h)anthracene	<0.28	<0.14	<0.14
Fluoranthene	<0.14	<0.07	<0.07
Fluorene	<0.14	<0.07	<0.07
Indeno(1,2,3-cd)pyrene	<0.28	<0.14	<0.14
3-Methylcholanthrene	<0.80	<0.40	<0.40
Naphthalene	<0.14	<0.07	<0.07
Phenanthrene	<0.14	<0.07	<0.07
Pyrene	<0.60	<0.30	0.446
Dibenzo(a,i)pyrene	<0.60	<0.30	<0.30

Notes:
<x.x = the compound was not detected above the laboratory detection limit of x.x.
bgs = below ground surface.
Sample locations are shown in Figure 2.
Laboratory reports are contained in the site assessment reports included in Appendices A and B.

Source: HLA, 1991a; HLA, 1991b.

TABLE 4

MAXIMUM METAL CONCENTRATION IN SOIL AMONG FOUR SITES
1028 Howard Street, 241 Sixth Street, 1009 Mission Street, and Seventh & Natoma Streets
San Francisco, CA
(mg/kg)

	1028 Howard Street		241 Sixth Street		1009 Mission Street		Seventh & Natoma Streets	
	Concentration[1]	Chemical of Concern	Concentration[2]	Chemical of Concern	Concentration[3]	Chemical of Concern	Concentration[4]	Chemical of Concern
Antimony	<3.0	No	3.8	No	<3.0	No	3.9	No
Arsenic	3.0	Yes	12.1	Yes	50.2	Yes	<1.0	No
Barium	145	No	160	No	224	No	197	No
Beryllium	<0.5	No	<0.5	No	<0.5	No	<0.5	No
Cadmium	<1.0	No	<1.0	No	4.1	No	1.4	No
Chromium	20.2	Yes	29.7	Yes	19.6	Yes	39.0	Yes
Cobalt	4.7	No	6.4	No	5.7	No	6.6	No
Copper	51.6	No	69.9	No	401	No	80.0	No
Mercury	<1.0	No	<1.0	No	<1.0	No	<1.0	No
Molybdenum	<1.0	No	<1.0	No	<1.0	No	<1.0	No
Nickel	16.9	No	37.2	No	15.0	No	20.6	No
Selenium	<3.0	No	<3.0	No	<3.0	No	3.1	No
Silver	<0.5	No	<0.5	No	<0.5	No	<0.5	No
Thallium	31.3	Yes	72.4	Yes	140	Yes	<1.0	No
Vanadium	16.9	No	30.7	No	23.3	No	25.0	No
Zinc	143	No	652	No	1,160	No	462	No
Lead[5]	3,700[5]	Yes	6,650[5]	Yes	12,800[5]	Yes	1,290[5]	Yes

[1] Sample B-3 at 9 feet below ground surface.
[2] Sample SS-3 at ground surface.
[3] Sample B-2 at 1.5 feet below ground surface.
[4] Sample B-1 at 2 feet below ground surface.
[5] Lead concentrations presented are the maximum observed in all the soil samples from each site and not necessarily associated with the sample that was analyzed for the remainder of the metals.

Sources: HLA, 1991b; HLA, 1993a; HLA, 1993b; HLA, 1993c.

TABLE 5

MAXIMUM POLYNUCLEAR AROMATIC HYDROCARBON CONCENTRATION IN SOIL AMONG FOUR SITES

1028 Howard Street, 241 Sixth Street, 1009 Mission Street, and Seventh & Natoma Streets
San Francisco, CA
(mg/kg)

	1028 Howard Street[1]		241 Sixth Street[2]		1009 Mission Street[3]		Seventh & Natoma Streets[4]	
	Concen-tration	Chemical of Concern	Concen-tration	Chemical of Concern	Concen-tration	Chemical of Concern	Concen-tration	Chemical of Concern
Acenaphthene	0.17	No	<0.7	No	0.36	No	<0.07	No
Acenaphthylene	0.13	No	<0.7	No	<0.35	No	<0.07	No
Anthracene	<0.7	No	<0.7	No	<0.35	No	<0.07	No
Benzo(a)anthracene	1.17	Yes	0.33	Yes	6.67	Yes	<0.07	No
Benzo(a)pyrene	0.92	Yes	<1.4	No	6.48	Yes	<0.14	No
Benzo(b)fluoranthene/ Benzo(k)fluoranthene	0.69	Yes	<0.7	No	8.10	Yes	<0.07	No
Benzo(g,h,i)perylene	0.22	No	<1.4	No	3.31	No	<0.14	No
Chrysene	1.10	Yes	0.30	Yes	7.78	Yes	<0.07	No
Dibenzo(a,h)anthracene	<1.4	No	<1.4	No	<0.07	No	<0.14	No
Fluoranthene	1.2	No	0.2	No	11.4	No	<0.07	No
Fluorene	<0.14	No	0.14	No	<0.35	No	<0.07	No
Indeno(1,2,3-cd)pyrene	<1.4	No	<1.4	No	9.51	Yes	<0.14	No
3-Methylcholanthrene	<4.0	No	<4.0	No	<2.0	No	<0.40	No
Naphthalene	<0.14	No	<0.7	No	1.49	No	<0.07	No
Phenanthrene	1.30	No	2.7	No	6.78	No	<0.07	No
Pyrene	1.10	No	0.45	No	14.1	No	0.446	No
Dibenzo(a,i)pyrene	<3	No	<3	No	<1.5	No	<0.3	No

1 Seven soil samples were analyzed for PNAs.
2 Five soil samples were analyzed for PNAs.
3 Seven samples were analyzed for PNAs.
4 Two samples were analyzed for PNAs.

Note: This table presents the maximum PNA concentrations from all samples collected from the respective sites and may represent results from more than one soil sample.

Sources: HLA, 1991b; HLA, 1993a; HLA, 1993b; HLA, 1993c.

TABLE 6

ASSUMPTIONS FOR CALCULATING $tHBL_n$ FOR SELENIUM
Residential Children
Seventh & Natoma Streets, San Francisco, California

Input	Abbreviation	Value
Exposure Duration (years)	ED1	5
Exposure Duration (days/year)	ED2	350
Inhalation Rate (m^3/day)	InR	15
Respirable Particulate Rate (mg/m^3)	RP	0.07
Pulmonary Absorption Factor	PAF	1
Ingestion Rate (mg/day)	IR	200
Oral Absorption Factor	OAF	1
Dermal Surface Area (cm^2/day)	DSA	4288
Soil Adherence Factor (mg/cm^2)	SAF	1
Dermal Absorption Factor-Metals	DAF	0.01
Body Weight (kg)	BW	13
Averaging Time for Noncarcinogens (days)	ATn	1825

Source: Table 4-4, HLA, 1993a.

TABLE 7

STATISTICS OF LEAD CONCENTRATION IN SOIL
Seventh & Natoma Streets, San Francisco, California

	All Data	**Data From ≤2′ bgs**	**Data From >2′ bgs**
Number of Measurements	10	5	5
Minimum (mg/kg)	4.7	9.1	4.7
Maximum (mg/kg)	1,290	1,290	7.5
Mean (mg/kg)	229	452	5.7
Standard Deviation	402	1.1	488
Variance	161,604	1.2	238,144
Standard Error	127	218	0.49
95% Upper Confidence Limit[1] (mg/kg)	462	918	6.7

Notes: bgs = below ground surface.

[1] One-tailed upper confidence limit.

TABLE 8

BLOOD LEAD CONCENTRATION
Seventh & Natoma, San Francisco, California
(μg/dl)

	50th Percentile	90th Percentile	95th Percentile	98th Percentile	99th Percentile
Average Lead Concentration at Site					
Adult	1.8	2.9	3.2	3.7	4.1
Child	3.9	6.1	7.0	8.0	8.9
95% One-Tailed Upper Confidence Concentration					
Adult	2.0	3.1	3.5	4.1	4.5
Child	4.9	7.6	8.7	10.0	11.0
Maximum Lead Concentration at Site					
Adult	2.6	4.0	4.6	5.3	5.8
Child	8.3	13.0	14.7	17.0	18.7

TABLE 9

SLOPE FACTOR AND REFERENCE DOSE FOR CHROMIUM VI
Seventh & Natoma Streets, San Francisco, California

	Oral		**Inhalation**	
Slope Factor (mg/kg-day)	4.2×10^{-1}	(D)	4.1×10^{1}	(I)
Chronic RfD (mg/kg-day)	5×10^{-3}	(I)	NA	

Note: NA = not available.

Sources: (I) = EPA, 1994 (IRIS)
(D) = DTSC, 1992.

REGIONAL LOCATION

Figure 1

Legend

■ Other SFRA Sites

0 2000 Feet

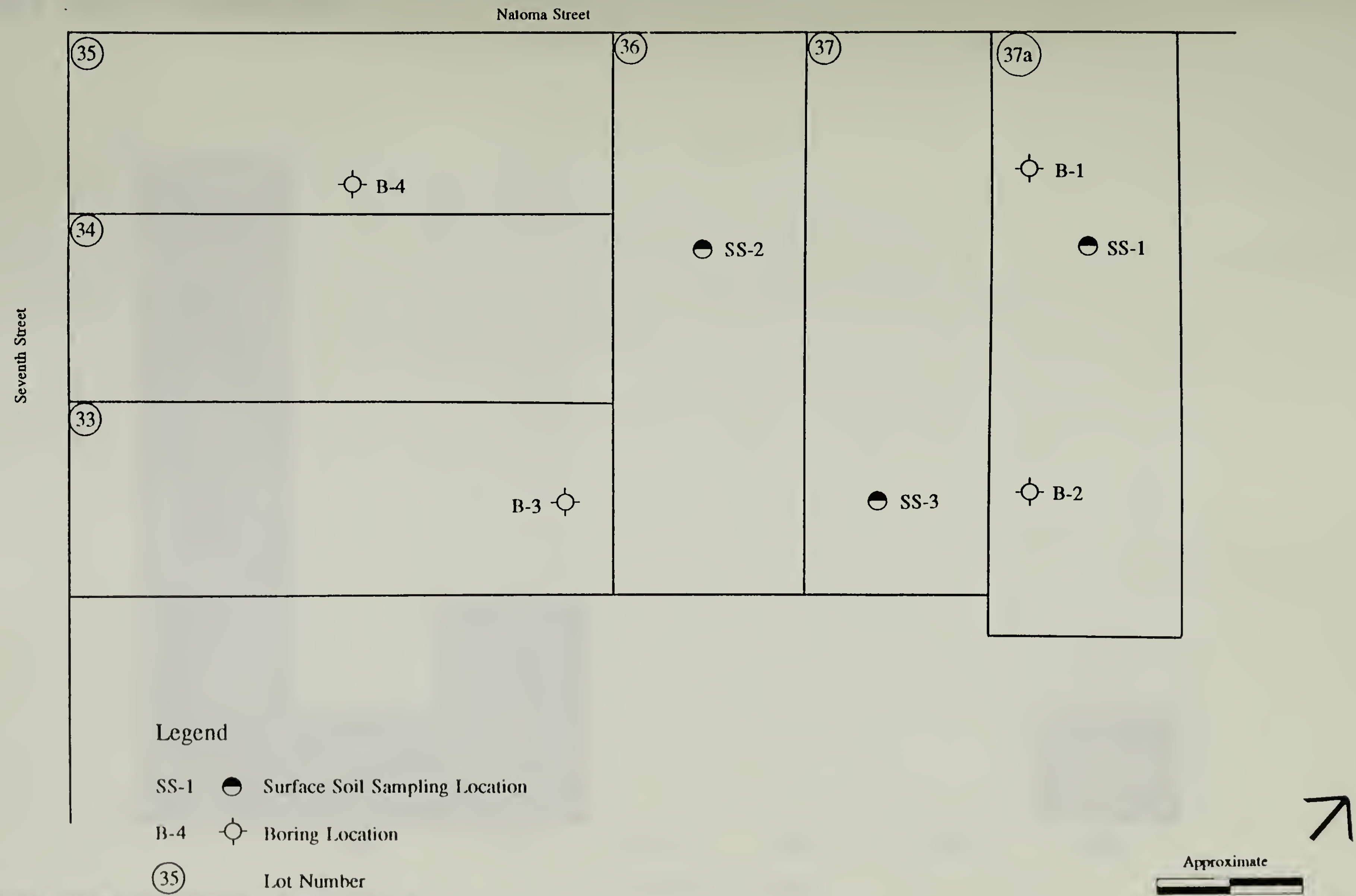
SEVENTH AND NATOMA STREETS
San Francisco, California

BASELINE

91315-IO 4/5/94

SAMPLE LOCATIONS

Figure 2



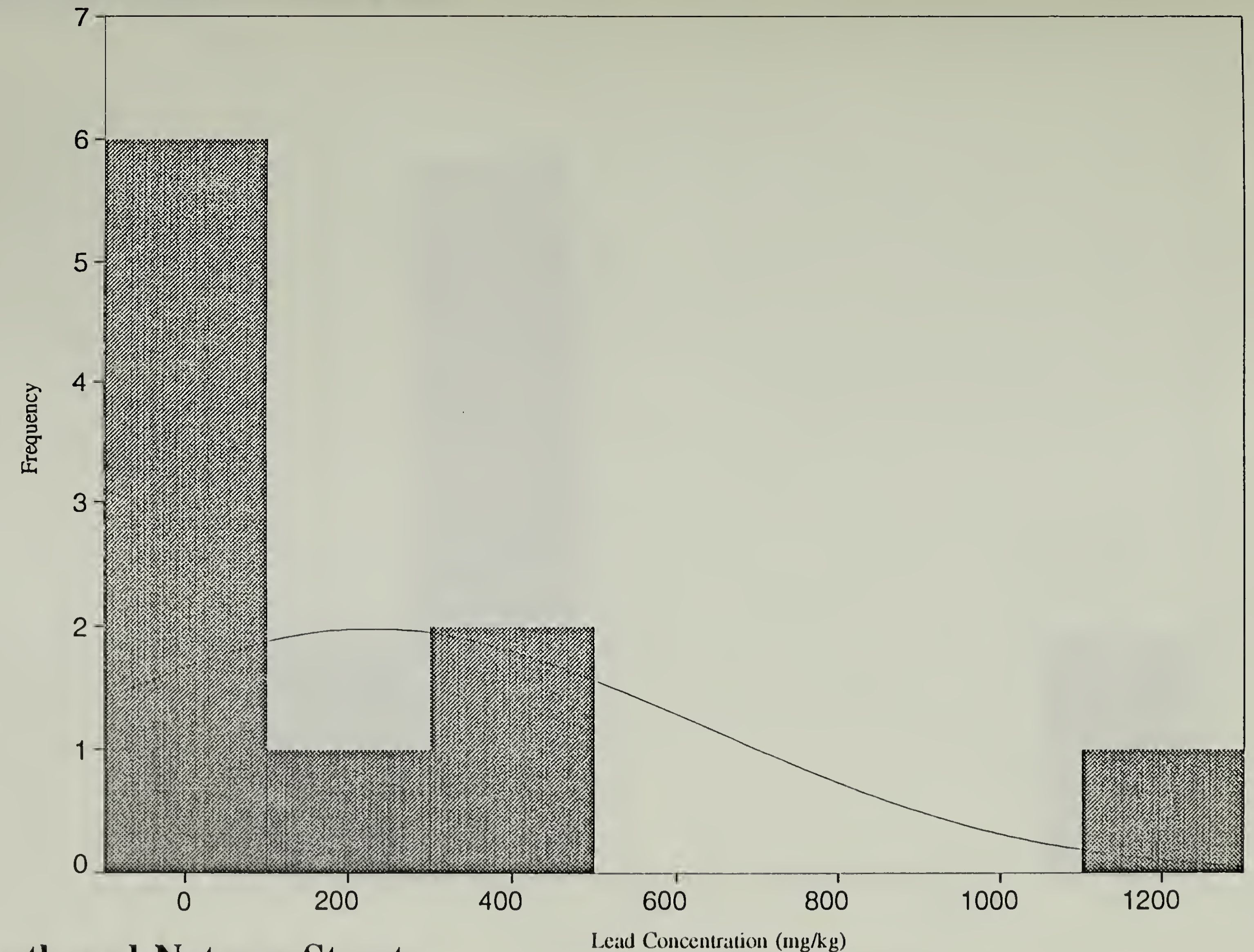
SEVENTH AND NATOMA STREETS
San Francisco, California

BASELINE

91315-IO 4/5/94

HISTOGRAM OF LEAD CONCENTRATION IN ALL SOIL SAMPLES

Figure 3

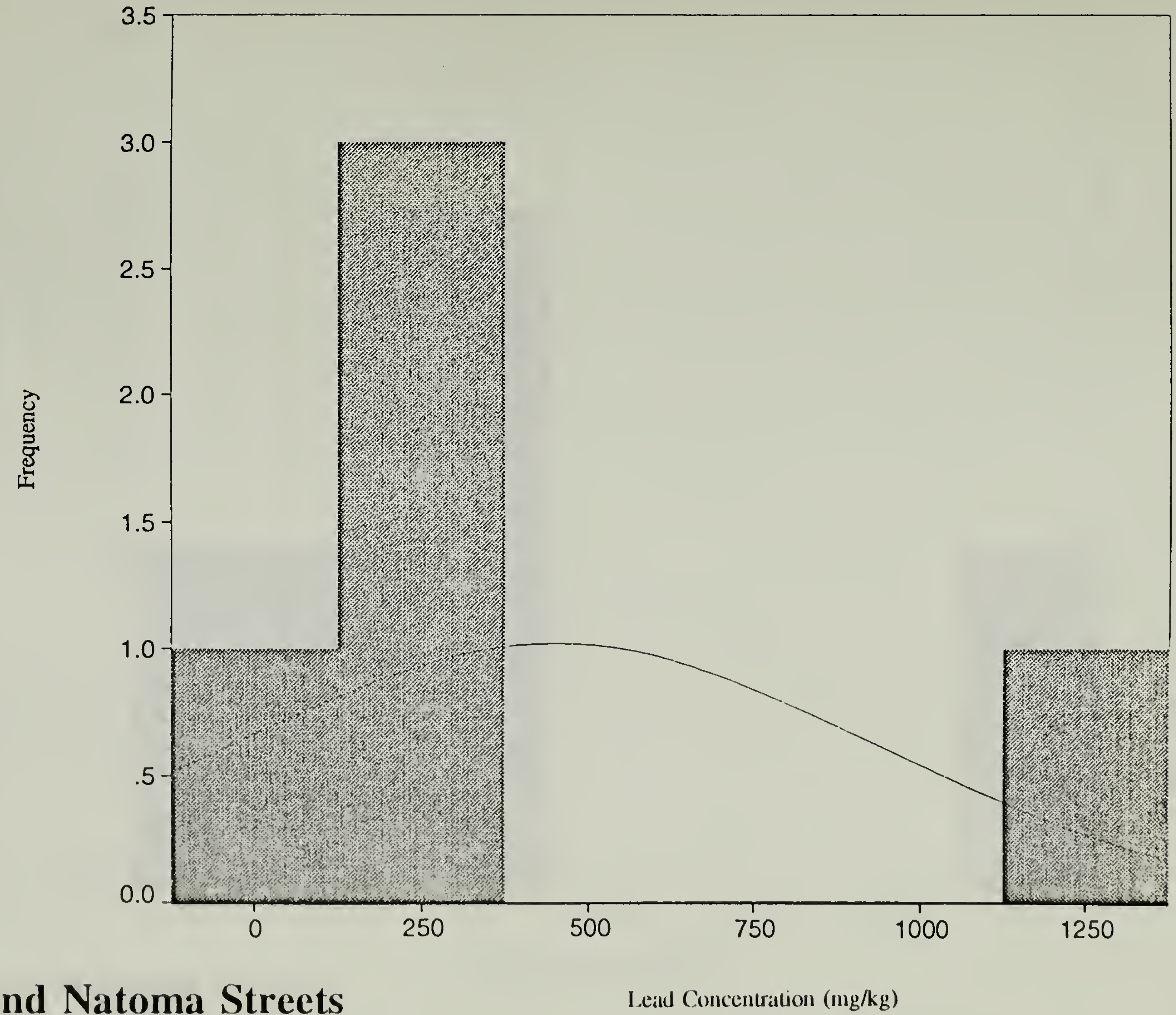


Seventh and Natoma Streets
San Francisco, California

BASELINE

HISTOGRAM OF LEAD CONCENTRATION IN SHALLOW SOIL SAMPLES

Figure 4



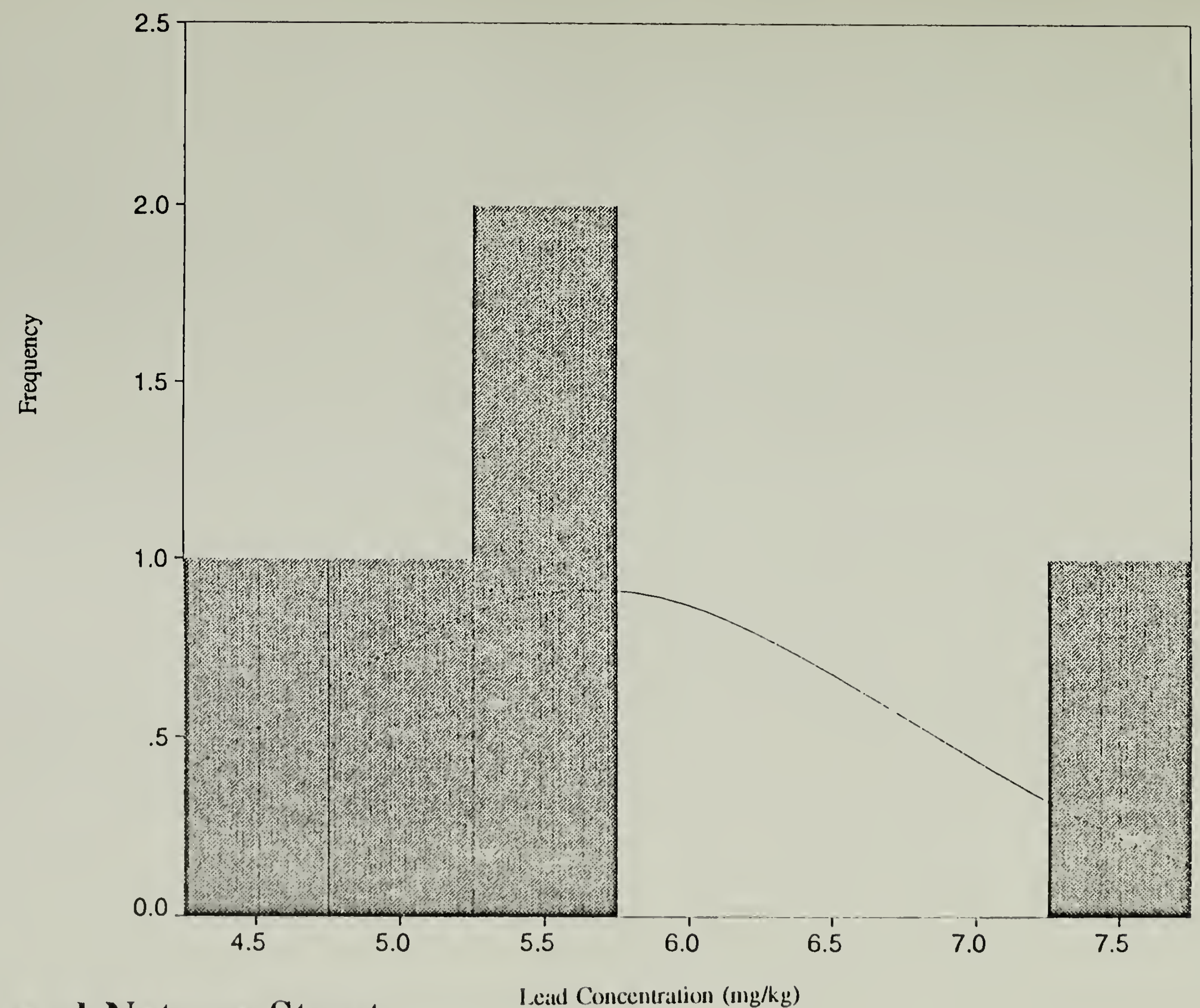
Seventh 'and Natoma Streets
San Francisco, California

BASELINE

91315-IO 4/14/94

HISTOGRAM OF LEAD CONCENTRATION IN DEEPER SOIL SAMPLES

Figure 5



Seventh and Natoma Streets
San Francisco, California

BASELINE

91315-IO 4/14/94

APPENDIX A

PHASE I SITE ASSESSMENT REPORT

A Report Prepared for

San Francisco Redevelopment Agency
770 Golden Gate Avenue
San Francisco, California 94102

**PHASE I PRELIMINARY HAZARDOUS MATERIALS SITE ASSESSMENT
SEVENTH AND NATOMA STREETS
SAN FRANCISCO, CALIFORNIA**

HLA Job No. 2222,055.04

by

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS iii

1.0 INTRODUCTION 1

2.0 SCOPE OF SERVICES 2

3.0 SITE DESCRIPTION 3

4.0 SITE HISTORY 4

5.0 REGULATORY REVIEW 9

5.1 Review of Published Regulatory Agency Lists 9
5.2 Summary of Sites on Regulatory Agency Lists 10
5.3 Review of Regulatory Agency Files 13

6.0 FIELD INVESTIGATION FINDINGS 17

6.1 Site Reconnaissance 17
6.2 Sampling and Analysis 17
6.3 Chemical Analysis 18

7.0 CONCLUSIONS AND RECOMMENDATIONS 20

8.0 BIBLIOGRAPHY 22

9.0 ILLUSTRATIONS 23

Appendices

A OWNERSHIP HISTORY
B LABORATORY REPORTS

DISTRIBUTION

LIST OF ILLUSTRATIONS

Plate 1	Study Area Map
Plate 2	Site Plan

1.0 INTRODUCTION

This report presents the results of a Phase I Preliminary Hazardous Materials Site Assessment (PSA) performed by Harding Lawson Associates (HLA) for a property at Seventh and Natoma Streets in San Francisco, California (Plate 1). The site is within San Francisco City Block 3726 and includes lot numbers 33, 34, 35, 36, 37, and 37A. The lots are owned by various individuals and organizations (see Appendix A, Ownership History). We understand that the San Francisco Redevelopment Agency is considering purchasing the property and constructing multi-family housing.

The purpose of this investigation was to provide information regarding the presence of hazardous and/or toxic materials which may have affected soil and/or groundwater beneath the site. This evaluation was based on information gathered from federal, state, and local regulatory agencies, reports provided by the client, published maps, aerial photographs, and an onsite and offsite reconnaissance.

2.0 SCOPE OF SERVICES

On December 10, 1990, Mr. William Nakamura of the San Francisco Redevelopment Agency (SFRA) authorized this assessment. Project tasks were performed in accordance with our standard PSA, and under our existing contract with the SFRA. The PSA consisted of the following tasks:

- Reviewing available documents and aerial photographs related to historical development of the site and adjacent properties.
- Reviewing reports available in HLA and San Francisco Department of Public Health files for information pertaining to soil and groundwater contamination in the site vicinity.
- Contacting appropriate federal, state, and local regulatory agencies for documented hazardous materials information concerning the site and the area within a 1/4 mile radius of the site.
- Performing an onsite and offsite reconnaissance to assess visible evidence of the generation, use, storage, or disposal of hazardous materials.
- Collecting near-surface soil samples and samples of suspected asbestos containing materials, and submitting the samples for analysis to assess the concentrations of lead, polynuclear aromatic hydrocarbons (PNAs), and asbestos.
- Evaluating findings and preparing this report.

3.0 SITE DESCRIPTION

The site is within San Francisco City Block 3726 and comprises Lots 33, 34, 35, 36, 37, and 37A. The site is bounded on the north by Natoma Street, commercial/residential buildings to the east and south, and Seventh Street to the west (Plate 2). The site is 11,275 square feet and is currently occupied by a three story concrete frame building on the northwestern corner of the site (Lot 35). The other lots at the site are currently vacant, however, concrete basement floor slabs may be beneath surface soils on Lots 36 and 37. Concrete basement walls and floor slab are present on Lot 34. No floor slabs were noticed on Lots 33 and 37A. The ground surface of Lots 36, 37, and 37A is approximately 6 feet lower than the sidewalk along Seventh and Natoma streets.

The site was formerly marshland that was filled during the late 1800s and early 1900s. The soil conditions beneath the site are likely to consist of sandy fill, sands, and marsh and/or bay mud layers. Our previous experience indicates that the fill layer may contain elevated levels of lead and polynuclear aromatic hydrocarbons (PNAs). Unless local groundwater dewatering systems are operating within the area, groundwater is expected to be encountered approximately 14 feet below street level. Groundwater is expected to flow in a southeasterly direction.

4.0 SITE HISTORY

Records at the City and County of San Francisco Assessor's Office were examined for information on the ownership history of each of the lots comprising the site. A property ownership history is included as Appendix A. Sanborn Fire Insurance Maps for 1887, 1899, 1913, 1950, and 1986 were examined to assess the changes in land use of the site during the past 100 years. City Directories for various years from 1925 to 1990 and aerial photographs taken in 1935, 1948, 1955, 1958, 1961, 1969, 1972, 1977, 1979, 1981, 1985, and 1989 were also reviewed for information on the site.

The following is a chronological history of the site based upon our review of Sanborn Maps, City Directories, aerial photographs, and the assessor's records.

1887 Sanborn Map: The site was occupied by four stores, a restaurant, and three homes. The area north of the site was occupied by homes. The area east of the site was occupied by homes, stores, and restaurants. The area south of the site was occupied by stores and a printing shop, which was directly south of the site. The area west of the site was occupied by a hotel, stores, and homes.

1899 Sanborn Map: The site was occupied by stores on the west side of the site, along Seventh Street. Three homes were on the east side of the site, along Natoma Street. The area north of the site was occupied by homes and stores. The area east of the site was occupied by homes, hotels, and stores. A San Francisco Gas Company facility was also east of the site, approximately 1650 feet away, at the corner of Fifth and Howard streets. The area south of the site was occupied by stores. The area west of the site was occupied by the same hotel noted on the 1887 Sanborn map, as well as home and stores.

1913 Sanborn Map: With the exception of a building containing three flats on Lot 37A, the site was vacant. The area north of the site was occupied by homes, flats and hotels, although a few stores were present along Mission Street. The area east of the

site was occupied by homes, and a number of vacant lots where homes existed before. The area south of the site also comprised homes and vacant lots. The area west of the site was occupied by stores and homes. The hotel noted on the 1887 and 1899 Sanborn maps and a number of other buildings were no longer present, and apparently were destroyed or damaged during the 1906 earthquake and fire.

1928 Assessor's Records: These records indicate that the current building on the northwest corner of the site (Lot 35) was built in 1928.

1929 Crocker-Langley City Directory: This directory contained the first listing for United Lighting Fixture at 169 Seventh Street (site).

1935 Aerial Photograph: The current building on the northwest corner of the site is shown in this photograph. The study area surrounding the site appeared to be a mix of commercial or light industrial and residential. A gasoline station apparently occupied the northwest corner of Howard and Seventh streets, directly west of the site.

1940 Polk City Directory: This directory contained the first listing for Bertelsen Meat Company at 583 Natoma Street (site).

1948 Aerial Photograph: Three buildings occupied the site in this photograph. One was located adjacent and south of the existing building on the site. The other building was on the east side of the site. The only other change in the area from the 1935 photograph was a second gasoline station on the southwest corner of Seventh and Howard streets.

1950 Sanborn Map: The site was occupied by three stores and what seemed to be the same building containing flats appearing on the 1913 Sanborn Map and in the 1935 and 1948 aerial photographs. The area north of the site was still occupied by a few flats, but the majority of the area was occupied by stores, warehouses, or hotels. The area east of the site was occupied by homes, flats, a mattress factory, and parking lots.

The area south of the site was occupied by homes and stores. The area west of the site was occupied by gasoline stations on both the northwest and southwest corners of Howard and Seventh streets. Several print shops were also located throughout the area, and the Greyhound bus terminal was just off Seventh Street, between Stevenson and Jessie streets.

1953 Polk City Directory: The following businesses or individuals were listed at addresses at the subject site: Modern Grocery at 163 Seventh Street; United Lighting Fixture at 169 Seventh Street; Velia Modes (dressmaker) at 173 Seventh Street; West Coast Novelty at 175 Seventh Street; Bertelsen Meat Company at 583 Natoma Street; Laura Hudlow at 585 Natoma Street; Anthony Oroszco at 587 Natoma Street.

1955 Aerial Photograph: There were no obvious changes from the 1948 photograph.

1958 Aerial Photograph: There were no obvious changes from the 1955 aerial photograph.

1961 Aerial Photograph: There were no obvious changes from the 1958 photograph.

1963 Polk City Directory: The following businesses or individuals not listed in the 1953 Polk City Directory were listed at addresses at the subject site: SP-Teri Company (boot makers) at 173 Seventh Street; Benco Party Favors at 175 Seventh Street; Francisco Gepalaga at 585 Natoma Street; C.C. Gepalaga at 585a Natoma Street.

1968 Polk City Directory: The following businesses not listed in the 1963 Polk City Directory were listed at the subject site: Busy Line 3 Restaurant at 175 Seventh Street; 583-585a were vacant; Carl J. Jonah at 587 Natoma Street.

1969 Aerial Photograph: Two of the six lots (Lots 34 and 35) comprising the site were occupied by a multi-storied building. The other four lots were vacant. The

surrounding areas were occupied by what appeared to be a mix of commercial or office buildings and flats. A large parking lot was present to the northeast of the site south of Mission Street. A bus facility was also to the north along Seventh Street, just south of Market Street. The two gasoline stations at Seventh and Howard streets were still apparent.

1972 Aerial Photograph: What appeared to be a gasoline station or car wash was along Mission Street between Sixth and Seventh streets. No other changes in the area were noted.

1977 Aerial Photograph: The only change noted in the study area was the absence of the gasoline station on the southwest corner of Howard and Seventh streets.

1978 Polk City Directory: The only listed addresses at the site were United Lighting Fixtures at 169 Seventh Street and Busy Line 3 Restaurant at 175 Seventh Street. The boot maker at 173 Seventh Street was last listed in the 1973 Polk City Directory. No addresses were listed on Natoma Street.

1979 Aerial Photograph: No apparent changes were noted at the site or in the surrounding area.

1981 Aerial Photograph: The only change noted within the study area was the expansion of a parking lot along Minna Street.

1982 Polk City Directory: The following businesses were listed at the subject site: United Lighting Fixture at 169 Seventh Street; Jorgensen-Frazier, Inc. (design consultants) at 173 Seventh Street; Busy Line Catering at 175 Seventh Street.

1985 Aerial Photograph: There were no obvious changes from the 1981 aerial photograph.

1986 Sanborn Map: The site was occupied by two buildings. The map indicated that the building on the northwest corner of the site was occupied by a store on the first

floor, and a fixture factory above the store. The other building, which was immediately south of the first, was occupied by a restaurant. The area north of the site was occupied by hotels, stores, flats, and a post office. The area east of the site was occupied by flats, a garment factory, a furniture store with some painting and repair, and an auto and truck rental business. The area south of the site was occupied by apartments, a sausage factory, a painter, and a print shop, as well as a number of retail stores. A gasoline station was located directly west of the site across Seventh Street. An unspecified laboratory was also west of the site. A Greyhound Bus Station was at Seventh and Mission, northwest of the site.

1989 Aerial Photograph: No changes were apparent at the subject site. The only significant change noted in the area was the absence of the gasoline station west of the site.

1990 Haines City Directory: The following businesses were listed at the subject site: Frazier Design at 173 Seventh Street; Sadie's Seventh Street Cafe at 175 Seventh Street. The address at 169 Seventh Street was listed as vacant.

5.0 REGULATORY REVIEW

The discussion presented in this section is based on available information provided by government regulatory agencies.

5.1 Review of Published Regulatory Agency Lists

As part of our assessment of whether there are potential sources of hazardous materials that may pose potential environmental concerns relative to the subject site, we reviewed the following agency lists:

- State of California Department of Health Services (DHS) Abandoned Sites List (October 1990)

  The DHS Abandoned Sites List indicates past and present potential hazardous waste sites that could be considered potential State Bond Expenditure Plan sites.

- DHS Expenditure Plan for the Hazardous Substance Cleanup Bond Act of 1984 (State Bond Expenditure Plan) (January 1989)

  The State Bond Expenditure Plan lists identified hazardous waste sites within the State of California that have been targeted for cleanup by responsible parties, the DHS, or the EPA for the next five fiscal years.

- San Francisco Bay Area Regional Water Quality Control Board (RWQCB) Fuel Leaks List (July 1990) and North Bay Toxics Cases List (July 1990)

  The RWQCB Fuel Leaks List for San Francisco County lists site names and addresses for reported fuel leaks from underground storage tanks.

  The RWQCB North Bay Toxics List lists cases included in the RWQCB Site Management System for San Francisco County.

- State of California Hazardous Waste and Substance Site List (Cortese List) (March 1990)

  The Cortese List is compiled by the California State Office of Planning and Research and indicates identified hazardous waste/substance sites within the State of California.

- State Water Resources Control Board (SWRCB) Hazardous Substance Storage Container Information for San Francisco County

  The SWRCB Hazardous Substance Storage Container Information List for San Francisco County identifies underground containers by owner and provides information on container type, year installed, capacity, piping, leak detection, and type of product reported to be stored in the container.

- U.S. Environmental Protection Agency (EPA) CERCLIS (February 1990)

  The CERCLIS List provides information for businesses or properties that are in the Federal Superfund program. Under this program, a business or property is identified and a preliminary assessment is performed to assess whether the site will become a Federal Superfund site.

- EPA National Priorities List (NPL) (March 1990)

  The NPL provides a list of Federal Superfund sites.

- The EPA Resource Conservation and Recovery Act (RCRA) Database

  The RCRA database lists generators and treatment, storage, or disposal facilities for hazardous materials. Unlike the previous lists, this is not an index of sites with known or suspected releases of hazardous substances.

- The State of California Waste Management Board (SWMB) Closed, Active, and Inactive Landfills List

  The SWMB List identifies closed, active, and inactive landfills within the State of California.

5.2 Summary of Sites on Regulatory Agency Lists

None of the addresses at the subject site appeared on any of the regulatory agency lists that were reviewed. However, a number of other sites within 1/4 mile of the subject site appeared on some of the regulatory agency lists. These sites are listed in Table 1 below which also lists the site location, the lists that they appeared on, and the listed site's distance and direction with respect to the subject site. A total of 95 sites

within the study area appeared on the DHS Abandoned Sites List. Table 1 lists only those sites within 1 block of the subject site.

Table 1. Sites Included on Regulatory Agency Lists Within 1/4 Mile of the Subject Site

Address	Name/Owner	List*	Status**	Approximate Distance and Direction
300 Fifth Street	Shell	RWQCB-FL, Cortese	Active	1/4 mile SE
1045 Mission Street	Unocal	RWQCB-FL, Cortese	Active	350 feet NE
1145 Mission Street	California Building Maintenance	RWQCB-FL,	Active	350 feet NW
1100 Howard Street	Shell	RWQCB-FL, Cortese	Active	65 feet W
416 Jessie Street	San Francisco Fire Dept.	RWQCB-FL, Cortese	Active	1/4 mile NE
574 Natoma Street	A-1 Metal Polishing Inc.	DHS-AS	NFA	60 feet NE
1162 Howard Street	John Avaiian	DHS-AS	PAL	100 feet SW
1077 Howard Street	Essex Wire Co.	DHS-AS	NFA	150 feet S
580 Natoma Street	F.T. Kreberly	DHS-AS	PAL	45 feet N
1080 Howard Street	Moore-Montroy Electrical Co.	DHS-AS	NFA	Adjacent SW
166 Seventh Street	West Coast Electric Works, Ltd.	DHS-AS	NFA	60 feet W
465 Stevenson Street	PG&E Gas Plant Station T	DHS-AS, RCRA CERCLIS	PDS 1 NFA	1/4 mile NE
560 Natoma Street	Atlas Screw Machine	RCRA	3	125 feet NE

Table 1. Sites Included on Regulatory Agency Lists Within 1/4 Mile of the Subject Site

Address	Name/Owner	List*	Status**	Approximate Distance and Direction
97 Howard Street	Auto Motion	RCRA	1	1/4 mile SE
974 Folsom Street	Chuck & Nally's Auto Repair	RCRA	2	1200 feet SE
1072 Howard Street	City Paints; Sant Auto Repair	RCRA	2	50 feet SE
981 Howard Street	Clown Auto Repair & Repair	RCRA	1	800 feet SE
1023 Mission Street	Diagnostic Auto Clinic	RCRA	1	500 feet NE
1171 Mission Street	Leemah Electronics, Inc.	RCRA	--	1100 feet NW
981 Howard Street	Matt's Auto Body	RCRA	1	800 feet SE
561 Minna Street	Perfection Transmission Parts	RCRA	3	125 feet N
1023 Mission Street	Rowlands Auto Repair	RCRA	3	500 feet NE
160 Russ Street	S&T Auto Service	RCRA	3	900 feet SE
925 Mission Street	San Francisco Newsletter Agency	RCRA	1	1/4 mile NE

Table 1. Sites Included on Regulatory Agency Lists Within 1/4 Mile of the Subject Site

Address	Name/Owner	List*	Status**	Approximate Distance and Direction
423 Tehama Street	Terra Firm	RCRA	1	1,000 feet SE
Seventh and Mission	U.S. Court of Appeals, U.S. Post Office	RCRA	1	250 feet N

*Explanation of Lists
RWQCB-FL = Regional Water Quality Control Board Fuel Leaks
Cortese = Hazardous Waste and Substance List
DHS-AS = Department of Health Services Abandoned Sites
RCRA = Resource Conservation and Recovery Act
CERCLIS = Comprehensive Environmental Response Compensation and Liability Information System

**Explanation of Status
NFA = No further action required
PAL = Preliminary assessment required, low priority
PDS = Status pending
1 = Regular generator of hazardous waste (>1000 kilograms per month)
2 = Small generator of hazardous waste (100 to 1000 kilograms per month)
3 = Very small generator of hazardous waste (<100 kilograms per month)
-- = Permit pending

5.3 Review of Regulatory Agency Files

A total of 95 sites within the study area are listed on the DHS Abandoned Sites List. These sites were identified by DHS as potential State Bond Expenditure Plan sites through review of Polk City Directories or manufacturer's directories. Following identification of the sites, the DHS mailed questionnaires to businesses at the sites, performed a file search, or performed a driveby reconnaissance of each site. On the

basis of these tasks, a status was assigned to each site. Of the 95 sites listed within the study area, seven are listed within 100 feet of the site (see Table 1 for the location of these six sites). Of these seven sites, four are listed as requiring no further action. Two of the sites require preliminary assessments, but are given low priority by the DHS. A seventh site, the PG&E Gas Plant, is pending because of its inclusion on EPA's CERCLIS List.

A total of 15 sites within the study area are listed on the EPA RCRA list, including one site within 50 feet of the site. These sites generate hazardous waste. Unlike most other lists that were reviewed, inclusion on the RCRA list does not indicate that a spill or release of hazardous materials generated at the site has occurred.

No sites within the study area were listed on the RWQCB North Bay Toxics list, the DHS State Bond Expenditure Plan, or the EPA National Priorities List.

HLA files contained information regarding two sites, one at 1045 Mission Street and a second 465 Stevenson Street.

1045 Mission, Unocal Station (former): The file contained a report of a leak at the Unocal Station, located approximately 350 feet northeast of the site. Three 10,000-gallon gasoline tanks and one 1000-gallon waste oil tank were removed by Blaine Tech Services in August 1988 prior to demolition of the station. Analysis of soil samples collected from beneath the tanks detected low concentrations of petroleum hydrocarbons.

After the Unocal station was removed, the site was operated by the Bubble Machine Carwash, which operated three gasoline storage tanks. The tanks are registered with the State Water Resources Control Board. The site is currently a parking lot; the tanks are still present beneath the sidewalk at this site.

465 Stevenson Street, PG&E Station T: The PG&E Station T, approximately 1/4 mile northeast of the subject site, between Fifth and Sixth Streets, is listed on the EPA's

CERCLIS and RCRA lists and the DHS Abandoned Sites list. The DHS profile report (May 1987) for this site indicates that volatile organic compounds (VOCs), lead, and arsenic were and are used at the site. Chemical analysis of soil samples taken from the site (date unknown) indicated the presence of polynuclear aromatic hydrocarbons (PNAs), lead, and arsenic at concentrations of 15 parts per million (ppm), 220 ppm, and 15 ppm respectively. The DHS lists the facility status as pending, based on the site's listing on the EPA CERCLIS list.

The PG&E site originally contained five underground fuel storage tanks; three 20,000-gallon diesel tanks are still in operation. The facility is now primarily used as a steam facility, but records indicate that it was operated historically as a gas manufacturing plant.

Files at the San Francisco Department of Public Health (SFDPH) for this site were reviewed by HLA. The files included applications by PG&E to abandon in-place two underground fuel storage tanks registered at the site. The tanks are 17,500 fuel oil tanks that were installed in 1923 beneath Stevenson Street. Three soil borings were drilled in March 1988 on either side and between the two tanks. Soil samples from these borings were analyzed, and only the sample from the middle boring, between the two tanks, contained hydrocarbon concentrations at 5 ppm of total petroleum hydrocarbons as diesel. A slight oily odor was reported in the soil from this boring to a depth of 16 feet, where the boring was terminated because of an obstruction. Because of the low concentrations of hydrocarbons in the soil, the SFDPH approved the plan to abandon the tanks in-place in December 1989.

<u>Locations of Sites with Registered Underground Storage Tanks</u>

Table 2 presents a list of sites within the study area that contain underground storage tanks (USTs) registered with the SWRCB. Inclusion on this list does not indicate

that a release of tank contents has occurred. The SWRCB Tank Registration was prepared in June 1988 and has not been updated; many tanks have since been removed or abandoned. In addition, sites in industrial areas of San Francisco commonly contain USTs not registered with the SWRCB.

Table 2. Registered Underground Tanks within 1/4 Mile of the Subject Site

Name/Owner	Approximate Distance and Direction From Site	Tank Capacity (gallons)	Type of Product
California Building Maintenance 1145 Mission Street	350 feet NW	500	Unleaded gasoline
Fire Station #1 416 Jessie Street	1/4 mile NE	550 550	Regular gasoline Diesel
Diagnostic Auto Clinic 1023 Mission Street	500 feet NE	1,000 1,000	Unleaded gasoline Unleaded gasoline
Bubble Car Wash 1045 Mission Street	350 feet NE	10,000 10,000 10,000	Premium gasoline Unleaded gasoline Regular gasoline
Pacific Gas & Electric Co. 66 Eighth Street	1000 feet NW	10,000 10,000	Mineral oil Mineral oil
San Francisco Newspaper Agency 925 Mission Street	1/4 mile NE	5,000 2,000	Diesel Waste oil
Shell Oil Co. 1100 Howard Street	65 feet W	550 8,000 5,000 5,000 6,000	Waste oil Regular gasoline Unleaded gasoline Unleaded gasoline Premium gasoline

6.0 FIELD INVESTIGATION FINDINGS

6.1 Site Reconnaissance

On December 13 and 14, 1990, HLA performed a visual reconnaissance of the site and surrounding area and looked for evidence of hazardous material usage that could be sources of soil or groundwater contamination.

No evidence of hazardous material releases were observed at the subject properties although most of the site is covered with litter. The exposed soil consisted of sand with construction debris. We observed materials such as floor tile, duct material, and roofing materials suspected of containing asbestos within the building at the site.

No apparent potential source of hazardous material releases were observed within 100 feet of the site with the exception of underground storage tanks. Suspect fuel oil tanks were noted at four locations: 150 Seventh Street; and 568, 574, and 576 Natoma Street. In addition, four tanks may exist beneath the sidewalk along the western side of Seventh Street south of Howard Street.

6.2 Sampling and Analysis

HLA collected three near-surface soil samples and 18 samples of suspect asbestos containing material (ACM) from the onsite building to provide a preliminary evaluation of onsite hazardous materials.

The soil samples were collected in stainless steel tubes at a depth of approximately 0.5 feet. The ends of the tubes were covered with Teflon and plastic caps and were stored in an iced cooler until delivery under chain-of-custody procedures to Eureka Laboratory in Sacramento, California.

Eighteen samples of ACM were collected from the onsite building by first misting the suspect ACM in water to minimize the release of any airborne fibers. Sampled materials were then cut or scraped from the substrate with a utility knife and

sealed in plastic sample bags. Bags were then labeled with a unique sample identification number. Whenever possible, samples were collected in areas where the materials suspected of containing asbestos were damaged or deteriorating.

6.3 Chemical Analysis

The three discrete soil samples were each analyzed for total lead using EPA Test Method 6010. Eureka Laboratory then composited the three samples and analyzed the composite sample for PNAs using EPA Test Method 8100.

The results of the analysis indicate concentrations of total lead for soil samples SS-1, SS-2, and SS-3 at 9.1 parts per million (ppm), 348 ppm, and 1290 ppm, respectively. No PNAs were detected in the composite soil sample.

The suspect ACM samples were analyzed using polarized light microscopy (PLM) in accordance with EPA Test Method 600/M4-82-020. The results of the ACM analyses are presented below. The laboratory reports are presented in Appendix B.

Sample I.D.	Location	Type	ACM Content
7N-001	Basement-heater duct	Air cell insulation	45%
7N-002	Basement-heater duct	Insulation tape	60%
7N-003	Basement-near stairway	Horse hair plaster	ND
7N-004	1st floor-front room	Green floor tile	ND
7N-005	1st floor-back room	Horse hair plaster	ND
7N-006	2nd floor-closet near office	Ceiling tile	ND
7N-007	Roof-eastern side	Roofing material	ND
7N-008	Roof-western side	Roofing material	ND
7N-009	Stairway between Floors No. 1 and 2	Horse hair plaster	ND
7N-010	1st floor-front room	Green floor tile	ND
7N-011	1st floor-front room	Green floor tile	ND
7N-012	1st floor-middle room	Duct material	20%
7N-013	2nd floor-office	Ceiling tile	ND
7N-014	2nd floor-office	Ceiling tile	ND

Sample I.D.	Location	Type	ACM Content
7N-015	2nd floor-restroom	White floor tile	ND
7N-016	2nd floor-restroom	White floor tile	ND
7N-017	3rd floor restroom	Brown floor tile	15%
7N-018	Roof-northern side	Roofing material	15%

ND = None detected.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The results of our site history investigation indicate that hazardous materials may have been used at the site by the former lighting fixture manufacturer and former boot maker. We judge the likeliness of past onsite disposal of lead, glues, solvents, or dyes to be relatively low. We therefore do not recommend testing for these constituents unless field observations during future investigations or construction indicate the presence of those compounds. In addition, soil and groundwater beneath the site may also have been impacted by petroleum hydrocarbons from offsite underground storage tanks in the area and from coal tar waste from the former PG&E plant.

According to the chemical analysis of soil sample SS-3, the soil contains concentrations of lead that exceed the state hazardous waste criteria of 1000 ppm as total lead. The lead is believed to have been incorporated within the fill following the 1906 earthquake and fire. Therefore, HLA considers the lead to be at background concentrations for the fill areas of San Francisco. No PNAs were detected in the analyzed composite soil sample, though PNAs are commonly detected in San Francisco fill and may be present in the fill at the site at lower depths. Further soil sampling and analysis should be performed prior to any excavation at the site to evaluate the levels of petroleum hydrocarbons, lead, and PNAs.

The results of the ACM sampling and analysis indicate that the thermal insulation on the heating ducts in the basement and first floor contain asbestos. The brown floor tile in the third floor restroom and one sample of roofing material also contained asbestos. The other samples of suspect ACM did not contain measurable quantities of asbestos. The purpose of our ACM sampling was to provide preliminary estimates of the amount of ACM in the building. HLA also suspects that the exhaust vent from the furnace that is within the northeast corner of the building may be asbestos containing

transite. As required by the Bay Area Air Quality Management District, all ACM must be removed from the building prior to demolition.

8.0 BIBLIOGRAPHY

California Department of Health Services, Abandoned Sites List, October 1990.

California Department of Health Services, Expenditure Plan for the Hazardous Substance Cleanup Bond Act of 1984, January 1989.

California Waste Management Board, Active and Inactive Landfills, July 1990.

Regional Water Quality Control Board, Fuel Leaks List, July 1990.

Regional Water Quality Control Board, North Bay Toxics, July 1990.

State Water Resources Control Board, Hazardous Substance Storage Container Information for San Francisco County.

U.S. Environmental Protection Agency, Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), February 1990.

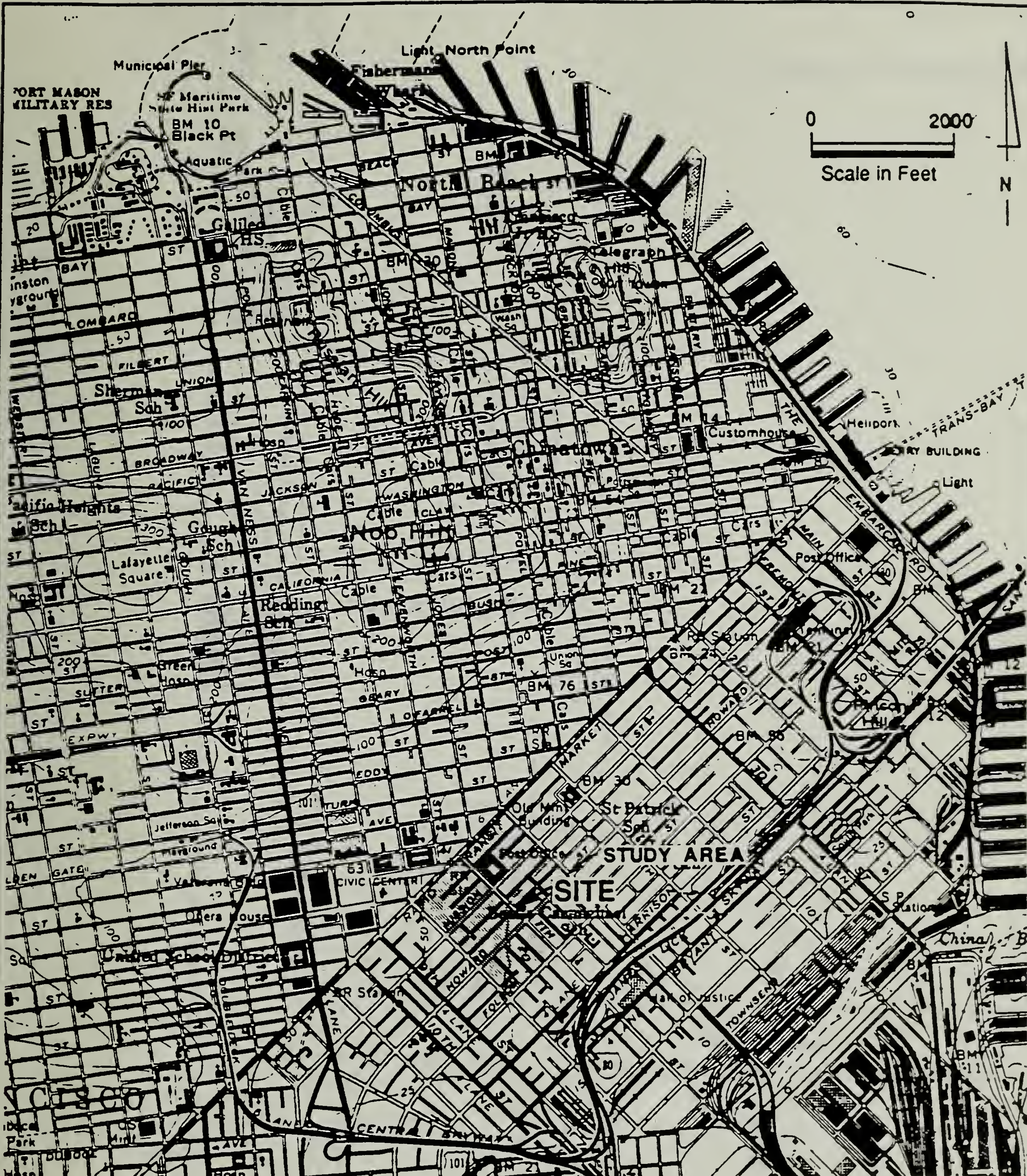
U.S. Environmental Protection Agency, National Priorities List, March 1990.

U.S. Environmental Protection Agency, Resource Conservation and Recovery Act (RCRA) Database, November 1988.

Areal Photographs - Pacific Areal Surveys, Inc.

PAS-AV-248-3/4 (1935)
PAS-AV-17-11-6/7 (1948
PAS-AV-170-7-5/6 (1955)
PAS-AV-279-9-6/7 (1958)
PAS-AV-432-6-4/5 (1961)
PAS-AV-933-6-5/6 (1969)
PAS-AV-1045-7-4/5 (1972)
PAS-AV-1356-6-4/5 (1977)
PAS-AV-1705-6-4/5 (1979)
PAS-AV-3556-6-3/4 (1989)
PAS-AV-2020-6-4/5 (1981)
PAS-AV-2670-5-5/6 (1985)

9.0 ILLUSTRATIONS



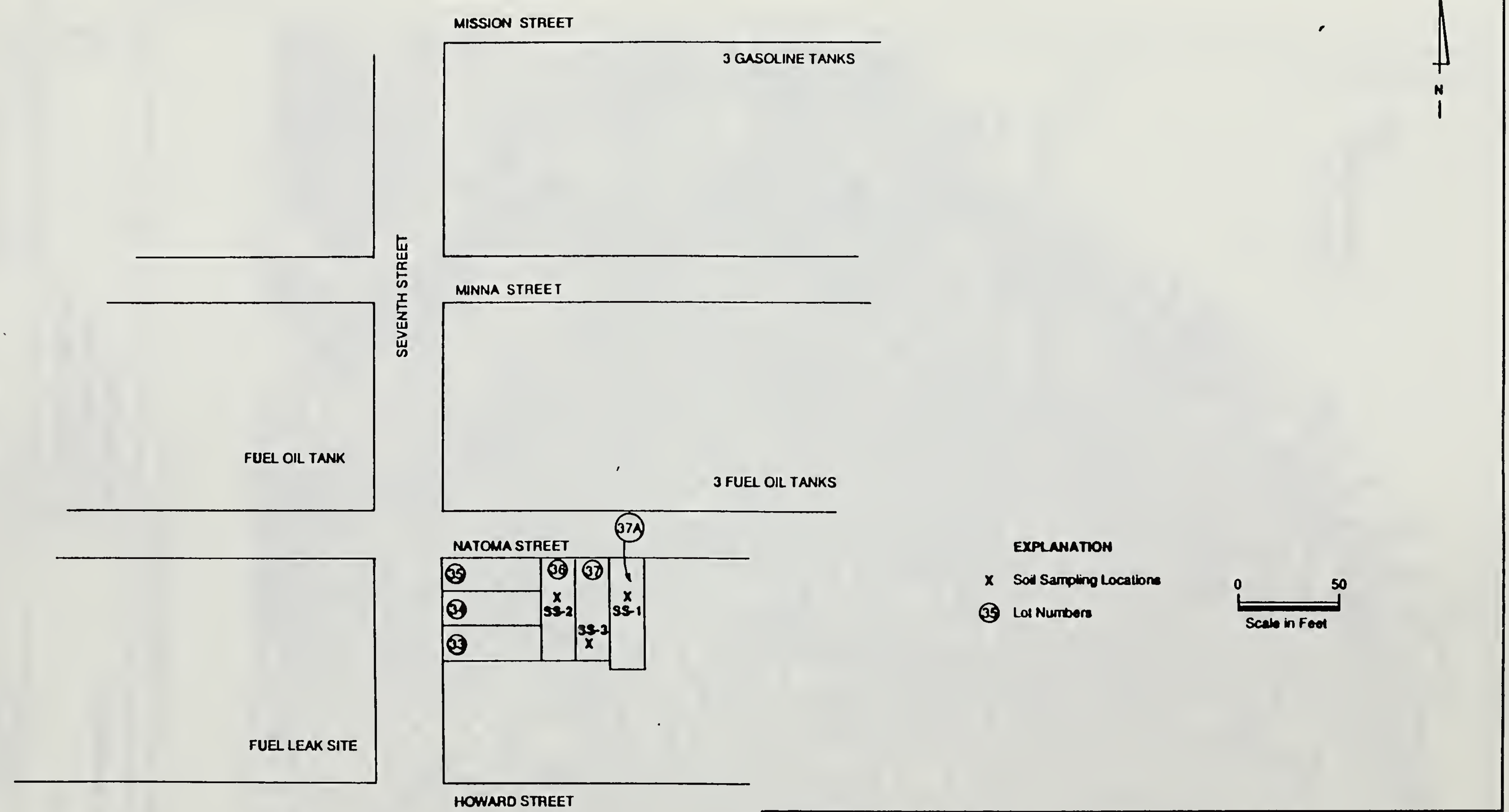
Base Map: USGS, San Francisco North, 7.5 Minute Quadrangle, 1973

Harding Lawson Associates
Engineering and
Environmental Services

Study Area Map
7th and Natoma Streets
San Francisco, California

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AM	2222,055.04	TLD	1/91	



Harding Lawson Associates Engineering and Environmental Services		Site Plan 7th and Natoma Streets San Francisco, California		PLATE 2
DRAWN AM	JOB NUMBER 2222,055.04	APPROVED TLO	DATE 1/91	REVISED DATE

135394

Appendix A

OWNERSHIP HISTORY

Ownership History - Seventh and Natoma Streets,
San Francisco City Block 3762

Lot Number	Date	Property Owner
33	December 1986	Alphonsine V. & Diane T. Grialou, Arlene V. Flynn
	November 1968	Rene C. Grialou
	February 1964	A. A. Tiscornia
	January 1958	Perfecto Manuta
	April 1919	Mortgage Underwriting & Realty Co.
	May 1918	A. Hirschberg, Adolph and Martha Cohn, & S.W. Green
34	May 1988	Florence Meyer, Pearl P. Stock, Herbert H. Sigrand
	February 1978	Florence Meyer, Ella Levy, Pearl P. Stock, Herbert H. Sigrand
	December 1972	Wells Fargo Bank
	January 1948	Roy I. & Rose Feldheym
	October 1947	Robert B. & Zorka McAnnich
	January 1945	Eugene M. Levy
35	March 1962	L.J. Janiszewski
	November 1952	Rigo Industrial Properties
	April 1927	F. Gottlicher, A.J. Tackle
	June 1926	Catherine & Jean Tignard
	July 1925	Helen E. Brown
	May 1922	Morris & Annie Warshawsky
	March 1915	Hib & L. Socry
	Unknown	Sophie Patton

Ownership History - Seventh and Natoma Streets,
San Francisco City Block 3762

Lot Number	Date	Property Owner
36	March 1962	L.J. Janiszewski
	November 1952	Rigo Industrial Properties
	April 1927	F. Gottlicher, A.J. Tackle
	June 1926	Catherine & Jean Tignard
	August 1925	Helen E. Brown
	Unknown	James Ryan
37	March 1968	Motels of San Francisco, Inc.
	February 1967	Board of Trade of San Francisco
	September 1956	Bertelsen Meat Co.
	August 1949	Frederick & Robert C. Spirz
37A	March 1968	Motels of San Francisco, Inc.
	February 1967	Board of Trade of San Francisco
	March 1958	Bertelsen Meat Co.
	October 1949	Martin L. Jr. & Kenneth A. Bertelsen

Appendix B

LABORATORY REPORTS

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis,
Research & Testing
Environmental Studies
Robotics
Toxicology

January 2, 1991

RECEIVED
JAN 7 1991
Harding Lawson Associates

Attn: J. Ordons
HARDING LAWSON ASSOCIATES
303 2nd Street, Suite 630N
San Francisco, CA 94105

Reference: ELI No: 90-12-164
Work Id: 222.055.04

Attn: J. Ordons:

Eureka Laboratories, Inc. is pleased to submit a laboratory report for the subject task. This report represents eight (8) samples for asbestos analysis which was received by the laboratory on December 14, 1990.

This report includes the following sections:

I. Sample description
II. Analysis method(s)
III. Analysis results

If you have any questions, please feel free to call us.

Sincerely,
EUREKA LABORATORIES, INC.

By: Seinaia Kar for
Shao-Pin Yo, Ph.D.
Laboratory Director

SPY/jln

Attachment

Eureka Laboratories, Inc. is a NVLAP certified laboratory for asbestos analysis. This report may not be used by the client to claim product endorsement by NVLAP or any agency of the United States Government.

SAMPLE ID: 7N-001

I. Sample Description

Grey Insulation, Fibrous Material

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulos-40%, (Non Fibrous Material-15%), Chysotile-40%, Crocidilite-5%

<u>THIS IS AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-002

I. Sample Description

Off-white, flat, fibrous, insulation similare to 7N-001 but lighter in color bedded in white plaster

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose Fibers-10%, Chrysotile-60%, Non-Fibrous Material-30%

<u>THIS IS AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-003

I. Sample Description

Small Transparent, Translucent and opaque particulate of different colors inbedded in white plaster

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

7 Cellulose Fibers-1%, Non-Fibrous Material-99%

<u>THIS</u> <u>IS</u> <u>NOT</u> <u>AN</u> <u>ASBESTOS</u> <u>CONTAINING</u> <u>MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-004

I. Sample Description

(Green Floor Tile - One Piece), Fibrous Grey woven mat material

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose Fibers-90%, Non-Fibrous Material-10%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-005

I. Sample Description

Paint (white) Plaster Layered

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose Fibers-5%, Non-Fibrous Material-95%

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-006

I. Sample Description

3/16" thick tile (fibrous) white paint

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose Fibers-95%, Non-Fibrous Material-5% (paint)

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-007

I. Sample Description

Black tar roofing fibrous

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose Fibers-50%, Non-Fibrous Material-50% (tar)

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

SAMPLE ID: 7N-008

I. Sample Description

Black tar with fibers

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose Fibers-50%, Non-Fibrous Material-50% (tar)

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-001	Chysotile-40% Crocidilite-5%	Cellulose-40% Non Fibrous-15%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal
Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-002	Chysotile-60%	Cellulose-10% Non Fibrous-30%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Joe H. McNeal
Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-003		Cellulose-99% 7 Cellulose Fibers-1%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal

Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-004		Cellulose-90% Non Fibrous Material-10%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal

Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-005		Cellulose-5% Non Fibrous Material-95%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal

Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-006		Cellulose-5% Non Fibrous Material-95%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal

Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-007		Cellulose-50% Non Fibrous Material-50%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal

Joe McNeal
Chemist

January 1, 1991
Date

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-164
Hazardous Waste Testing
Certification: E765

CLIENT: HLA-SF
PROJECT: 2222.055.04

DATE RECEIVED: 12/14/1990
DATE ANALYZED: 12/20/1990
DATE COMPLETED: 12/20/1990

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-008		Cellulose-50% Non Fibrous Material-50%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 1, 1991
Date

HLA
...ing L...n Ass...
3... ...nd Street, Suite 630N
San ... ...cisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

Do...4
90.12.164

CHAIN OF CU... ...ODY FORM

Lab: Eureka

Job Number: 2222.056.04
Name/Location: 7TH & Natoma
Project Manager: A Ordons

Samplers: A Ordons

Recorder: Ann Ordons (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr Wk Seq	DATE: Yr Mo Dy	Time	STATION DESCRIPTION/ NOTES
								7N-001	901213		
								7N-002			
								7N-003			
								7N-004			
								7N-005			
								7N-006			
								7N-007			
								7N-008			

ANALYSIS REQUESTED	
EPA 601/8010	
EPA 602/8020	
EPA 624/8240	
EPA 625/8270	
ICP METALS	
EPA 8015M/TPH	
ASBESTOS	X

LAB NUMBER: Yr Wk Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
A Ordons	[illegible]	12/13 370
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY (Signature) DATE/TIME	RECEIVED FOR LAB BY (Signature) [illegible]	DATE/TIME 12/14 1600

METHOD OF SHIPMENT Concord Courier

Laboratory Copy White · Project Office Copy Yellow · Field or Office Copy Pink

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis,
Research & Testing
Environmental Studies
Robotics
Toxicology

January 30, 1991

Mr. J. Ordons
HARDING LAWSON ASSOCIATES
303 2nd Street, Suite 630N
San Francisco, CA 94105

Reference: ELI No: 91-01-116

Attn: Mr. J. Ordons

Eureka Laboratories, Inc. is pleased to submit a laboratory report for the subject task. This report represents ten (10) samples for asbestos analysis which was received by the laboratory on January 15, 1991.

This report includes the following sections:

I. Sample description
II. Analysis method(s)
III. Analysis results

If you have any questions, please feel free to call us.

Sincerely,

EUREKA LABORATORIES, INC.

By: Shao-Pin Yo
Shao-Pin Yo, Ph.D.
Laboratory Director

SPY/jb

Attachment

Eureka Laboratories, Inc. is a NVLAP certified laboratory for asbestos analysis. This report may not be used by the client to claim product endorsement by NVLAP or any agency of the United States Government.

SAMPLE ID: 7N-009

I. Sample Description

White plaster small pebbles, some fibrous material

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose - 5%, Non-fibrous Material - 95%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-009	0%	Cellulose - 5% Non-fibrous Material - 95%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe W. McNeal

Joe McNeal
Chemist

January 30, 1991
Date

ID: 7N-010

Sample Description

Green Floor Tile

Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

Analysis Results

No fibrous material, green floor tile, white pebbles

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-011	0%	Cellulose - 50% Non-fibrous Material - 50%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-012

I. Sample Description

Beige Material Fibrous Paint Friable

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Chrysotile - 20%, Cellulose - 10%, Non-fibrous Material - 70%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-012	Chrysotile - 20%	Cellulose - 10% Non-fibrous Material - 70%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-013

I. Sample Description

White Ceiling Tile

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose - 95%, Non-fibrous Material - 5% (Paint)

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-013	0%	Cellulose - 95% Non-fibrous Material - 5% (Paint)

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-014

I. Sample Description

Same as 7N-013

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-014	0%	Cellulose - 95% Non-fibrous Material - 5% (Paint)

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-015

I. Sample Description

White Floor Tile

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Cellulose - 3%, Non-fibrous Material - 97%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-015	0%	Cellulose - 3% Non-fibrous Material - 97%

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-016

I. Sample Description

Floor Tile

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Non-fibrous

<u>THIS IS NOT AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-016	0%	Non-fibrous

THIS IS NOT AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-017

I. Sample Description

Beige floor tile with black mastic

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Chrysotile 15% (Asbestos found in black mastic adhesive)
Cellulose 20%
Non-fibrous material 65%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-017	Chrysotile - 15%	Cellulose - 20% Non-fibrous Material - 65%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Joe McNeal
Chemist

January 30, 1991
Date

SAMPLE ID: 7N-018

I. Sample Description

Black Tar

II. Analytical Methods

EPA Method 600/M4-82-020 was used for this analysis. Initially, the sample was examined under a stereomicroscope. After suitable treatment, the materials were then analyzed in immersion oils using Polarizing Light Microscopy (PLM with the addition of a dispersion staining objective). The presence of asbestos types was noted and the area percentage of each type of asbestos present was estimated.

For the purposes of this report, "asbestos fibers" are defined as having an aspect ratio (length/width) >5:1 and are positively identified as one of the following minerals:

Amosite
Anthophyllite
Actinolite / Tremolite series (Including Ferro-Actinolite)
Chrysotile
Crocidolite

An "asbestos containing material" contains more than 1% asbestos.

III. Analysis Results

Chrysotile 15%
Cellulose 5%
Non-fibrous material 80%

<u>THIS IS AN ASBESTOS CONTAINING MATERIAL</u>.

Note: Determinations apply only to the sample as received. The analysts did not participate in the sampling and thus cannot generalize the results to larger or more extensive masses.

Results are on the attached data sheet.

ASBESTOS
EPA PUBLICATION 600/M4-82-020

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: N/A
DATE ANALYZED: 01/22/1991
DATE SAMPLED: 01/11/1991

SAMPLE ID.	ASBESTOS VOL %	NON-ASBESTOS MATERIALS VOL %
7N-018	Chrysotile - 15%	Cellulose - 3% Non-fibrous Material - 80%

THIS IS AN ASBESTOS CONTAINING MATERIAL.

Joe N. McNeal
Joe McNeal
Chemist

January 30, 1991
Date

Harding Lawson Associates
303 Second Street, Suite 630N
San Francisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

B-7
91-01-116

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222,055.04
Name/Location: 7th & Natoma
Project Manager: J. Ordons

Samplers: T. Campbell
Recorder: (signature) (Signature Required)

SOURCE CODE	Water	Sediment	Soil	Oil	Unpres.	H_2SO_4	HNO_3	Sample Yr	Sample Wk	Sample Seq	Date Yr	Date Mo	Date Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	TPH (G&D)
48			X		X					B-4	91	01	11	1030	A1							X	X

(MATRIX: Water, Sediment, Soil, Oil; CONTAINERS & PRESERV.: Unpres., H_2SO_4, HNO_3; SAMPLE NUMBER OR LAB NUMBER: Yr, Wk, Seq; DATE: Yr, Mo, Dy, Time; ANALYSIS REQUESTED)

LAB NUMBER Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
(signature)	J. Oelen	1/11/91 4:00
J. Oelen	(signature)	1/15/91 9:47

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		(signature)	1/15/91 1:15

METHOD OF SHIPMENT: Concord Courier

Laboratory Copy Project Office Copy Field or Office Copy

HLA Harding Lawson Associates
San Second Street, Suite 630N
San Francisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

B-7
91-01-116

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222.055.04
Name/Location: 7TH & Natoma
Project Manager: Jim Ordons

Samplers: J Ordons
Recorder: J Ordons (Signature Required)

Source Code	Matrix: Water	Matrix: Sediment	Matrix: Soil	Matrix: Oil	#Containers & Preserv.: Unpres.	H_2SO_4	HNO_3	ICE	Sample Number or Lab Number: Yr / Wk / Seq	Date: Yr	Mo	Dy	Time	Station Description/Notes	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	TPH (GAS)
42			X					X	B3 06'	91	01	14		A2							X	
									B3 010.5'					A3							X	X
									B3 014'					~~A4~~						ON	HOLD	

Lab Number: Yr	Wk	Seq	Depth in Feet	Col Mtd CD	QA Code	Miscellaneous

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
J Ordons	Richard Miller	1/15/91 9:47

Dispatched by: (Signature)	Date/Time	Received for lab by: (Signature)	Date/Time
		[illegible signature]	1/15/91 1410

Method of Shipment: Concord Courier

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

HLA Harding Lawson Associates
303 Second Street, Suite 630N
San Francisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

B3-7
91-01-16

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222.055.04
Name/Location: 7TH & Natoma
Project Manager: Jim Ordons

Samplers: J Ordons
Recorder: Jim Ordons
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE		SAMPLE NUMBER OR LAB NUMBER (Yr / Wk / Seq)	DATE (Yr / Mo / Dy / Time)	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	PNA's (EPA 8100)	TPH (G & D)	CAM-17 METALS
48			X					X		B1 0 2'	91 01 14	A4										X
										B1 0 4.5'		A5							X	X		
										B1 0 9'		A6							X	X	X	
									*	B1 0 9.5'								ON HOLD				
									*	B1 0 14'								ON HOLD				
										B2 0 1.5'		A7							X			
										B2 0 10'		A8									X	
									*	B2 0 14'								ON HOLD				

LAB NUMBER (Yr / Wk / Seq)	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
J Ordons	Rick Mill	1/15/91 9:47
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY (Signature) DATE/TIME	RECEIVED FOR LAB BY (Signature)	DATE/TIME 1/15/91 1410

METHOD OF SHIPMENT Concord Courier

Laboratory Copy Project Office Copy Field or Office Copy

HLA
Howard Street, Third Floor
San Francisco, California 94105
415/543-8422
Telecopy: 415/777-9706

B-7
91-01-116

CHAIN OF CUSTODY FORM

Lab: ___

Job Number: 2222,055.04
Name/Location: 7th & Natoma
Project Manager: Jim Ardons

Samplers: T. Olso
Recorder: T. Olso
(Signature Required)

Source Code	Water	Sediment	Soil	Oil	Unpres.	H_2SO_4	HNO_3	Sample Yr	Sample Wk	Sample Seq	Date Yr	Date Mo	Date Dy	Time	Station Description/Notes	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.	asbestos - PLM
90									7N	009	91	01	11	0915	plaster - stairway 9A								✓
↓									7N	010	↓	↓	↓	0925	green floor tile 10A								✓
↓									7N	011	↓	↓	↓	0927	greenfloortile / backing 11A								✓
↓									7N	012	↓	↓	↓	0930	duct material 12A								✓
↓									7N	013	↓	↓	↓	0940	white ceiling tile 13A								✓
↓									7N	014	↓	↓	↓	0941	white ceiling tile 14A								✓
↓									7N	015	↓	↓	↓	0945	white floor tile 15A								✓
↓									7N	016	↓	↓	↓	0948	white floor tile 16A								✓
↓									7N	017	↓	↓	↓	0953	brown floor tile 17A								✓
↓									7N	018	↓	↓	↓	1000	roofing tar 18A								✓

Lab Number Yr	Lab Number Wk	Lab Number Seq	Depth in Feet	Col Mtd CD	QA Code	Miscellaneous

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Terry L. Olso	Richard Mell...	1/15/91 9:47

Dispatched by: (Signature)	Date/Time	Received for Lab by: (Signature)	Date/Time
		[illegible]	1/15/91 1410

Method of Shipment:

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis,
Research & Testing
Environmental Studies
Robotics
Toxicology

January 2, 1991

Mr. Jim Ordons
HARDING LAWSON ASSOCIATES
303 2nd Street, Suite 630N
San Francisco, CA 94105

RECEIVED
JAN 7 1991
Harding Lawson Associates

Reference: Job #: 2222.055.04
Location: 7th & Natoma
ELI No.: 90-12-165

Dear Mr. Ordons:

Eureka Laboratories, Inc. is pleased to submit a laboratory report for the subject task. This report presents analytical results for three (3) soil samples for the following analyses:

ANALYSIS	METHOD	SAMPLE ID.
Polynuclear Aromatic Hydrocarbons	EPA 8100	SS-1, SS-2, SS-3
Total Lead	EPA 6010	same as above

Sincerely,

EUREKA LABORATORIES, INC.

By: [signature] for
Shao-Pin Yo, Ph.D.
Laboratory Director

SPY/jb

Attachment

TOTAL LEAD
EPA 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-165
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222.055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 12/14/1990
DATE EXTRACTED: 12/18/1990
DATE COMPLETED: 12/27/1990
DATE SAMPLED: 12/13/1990

SAMPLE ID.	UNITS [mg/Kg (ppm)]
SS-1	9.1
SS-2	348
SS-3	1290
Method Blank	<3.0

Matrix Spike Recovery * - 75%
Matrix Spike Recovery Duplicate * - 74%

* This set of matrix spike is from another sample of the same matrix and of the same analytical batch.

This detection limit is based on the dilution factor of 50.

Detection Limit: 3.0 [mg/Kg (ppm)]

Josie Quiambao
Josie Quiambao
Chemist

January 2, 1991
Date

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: SS-1,SS-2,SS-3 (COMP 3)

DATE SAMPLED: 12/13/90
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90
DILUTION FACTOR: 2.00

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.14	.14
208-96-8	Acenaphthylene	<.14	.14
120-12-7	Anthracene	<.14	.14
56-55-3	Benzo(a)athracene	<.14	.14
50-32-8	Benzo(a)pyrene	<.28	.28
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.14	.14
191-24-2	Benzo(g,h,i)perylene	<.28	.28
218-01-9	Chrysene	<.14	.14
53-70-3	Dibenzo(a,h)anthracene	<.28	.28
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.14	.14
86-73-7	Fluorene	<.14	.14
193-39-5	Indeno(1,2,3-cd)pyrene	<.28	.28
	3-Methylcholanthrene	<.80	.80
91-20-3	Naphthalene	<.14	.14
85-01-8	Phenanthrene	<.14	.14
129-00-0	Pyrene	<.60	.60
	Dibenzo(a,i)pyrene	<.60	.60
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.
Higher detection limit is due to matrix interference.

Chemist Mark Shih — 12/27/90

Mark Shih, Ph.D. — Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: METHOD BLANK

DATE SAMPLED:
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90
DILUTION FACTOR: 1.0

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.07	.07
208-96-8	Acenaphthylene	<.07	.07
120-12-7	Anthracene	<.07	.07
56-55-3	Benzo(a)athracene	<.07	.07
50-32-8	Benzo(a)pyrene	<.14	.14
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.07	.07
191-24-2	Benzo(g,h,i)perylene	<.14	.14
218-01-9	Chrysene	<.07	.07
53-70-3	Dibenzo(a,h)anthracene	<.14	.14
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.07	.07
86-73-7	Fluorene	<.07	.07
193-39-5	Indeno(1,2,3-cd)pyrene	<.14	.14
	3-Methylcholanthrene	<.40	.40
91-20-3	Naphthalene	<.07	.07
85-01-8	Phenanthrene	<.07	.07
129-00-0	Pyrene	<.30	.30
	Dibenzo(a,i)pyrene	<.30	.30
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist [signature] 12/27/90

Mark Shih, Ph.D. Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: REAGENT SPIKE RECOVERY

DATE SAMPLED:
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90

CAS#	COMPOUND	RESULT
83-32-9	Acenaphthene	**91%**
208-96-8	Acenaphthylene	**94%**
120-12-7	Anthracene	**106%**
56-55-3	Benzo(a)athracene	**105%**
50-32-8	Benzo(a)pyrene	**117%**
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	**114%**
191-24-2	Benzo(g,h,i)perylene	**112%**
218-01-9	Chrysene	**NA**
53-70-3	Dibenzo(a,h)anthracene	**NA**
	Dibenz(a,j)acridine	**NA**
206-44-0	Fluoranthene	**100%**
86-73-7	Fluorene	**91%**
193-39-5	Indeno(1,2,3-cd)pyrene	**NA**
	3-Methylcholanthrene	**NA**
91-20-3	Naphthalene	**88%**
85-01-8	Phenanthrene	**82%**
129-00-0	Pyrene	**103%**
	Dibenzo(a,i)pyrene	**NA**
	Benzo(j)fluoranthene	**NA**
	Dibenz(a,h)acridine	**NA**
	7H-Dibenzo(c,g)carbazole	**NA**
	Dibenzo(a,e)pyrene	**NA**
	Dibenzo(a,h)pyrene	**NA**

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.
Reagent spike set is used due to matrix interference.

Chemist Mark Shih
Mark Shih, Ph.D.

12/27/90
Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: REAGENT SPIKE RECOVERY DUP

DATE SAMPLED:
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90

CAS#	COMPOUND	RESULT
83-32-9	Acenaphthene	94%
208-96-8	Acenaphthylene	97%
120-12-7	Anthracene	106%
56-55-3	Benzo(a)athracene	100%
50-32-8	Benzo(a)pyrene	113%
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	102%
191-24-2	Benzo(g,h,i)perylene	108%
218-01-9	Chrysene	NA
53-70-3	Dibenzo(a,h)anthracene	NA
	Dibenz(a,j)acridine	NA
206-44-0	Fluoranthene	100%
86-73-7	Fluorene	96%
193-39-5	Indeno(1,2,3-cd)pyrene	NA
	3-Methylcholanthrene	NA
91-20-3	Naphthalene	90%
85-01-8	Phenanthrene	82%
129-00-0	Pyrene	103%
	Dibenzo(a,i)pyrene	NA
	Benzo(j)fluoranthene	NA
	Dibenz(a,h)acridine	NA
	7H-Dibenzo(c,g)carbazole	NA
	Dibenzo(a,e)pyrene	NA
	Dibenzo(a,h)pyrene	NA

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.
Reagent spike set is used due to matrix interference.

Chemist [signature] 12/27/90

Mark Shih, Ph.D. Date

NA=NOT AVAILABLE

HLA Harding Lawson Associates
303 [illegible]d Street, Suite 630N
San [illegible]cisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

BB-5
90.12.165

CHAIN OF CU[illegible]ODY FORM

Lab: Eureka

Job Number: 2222.055 04

Name/Location: 7TH & Natoma

Project Manager: J Cudens

Samplers: J Cudens

Recorder: J Cudens (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
			X					X	SS	-1		90	12	13		Surface Soil
									SS	2						Samples
									SS	-3						
																Composite SS 1,2,3
																for PNA analysis

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	PNA's EPA 8310	(Composite 3 samples)
						X		
						X		
						X		
							X	

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
J Cudens	[illegible]	12/12 | 330
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		[illegible]	12/14 | 1:20

METHOD OF SHIPMENT Concord Courier

DISTRIBUTION

3 copies: San Francisco Redevelopment Agency
770 Golden Gate Avenue
San Francisco, California 94102

Attention: Mr. William Nakamura

TLO/JO/dm/B9875-R48

QUALITY CONTROL REVIEWER

Cheryl Lee Nelson

Cheryl Lee Nelson
Project Hydrogeologist

APPENDIX B

PHASE II SITE ASSESSMENT REPORT

A Report Prepared for

San Francisco Redevelopment Agency
770 Golden Gate Avenue
San Francisco, California 94102

PHASE II PRELIMINARY SITE ASSESSMENT
SOIL SAMPLING AND CHEMICAL ANALYSIS
SEVENTH AND NATOMA STREETS
SAN FRANCISCO, CALIFORNIA

HLA Job No. 2222,055.04

by

Anthony F. Campbell
Geologist

James Ordons
Geologist

REGISTERED GEOLOGIST
JAMES ORDONS
4922
STATE OF CALIFORNIA

Harding Lawson Associates
303 Second Street, 630 North
San Francisco, California 94107
415/543-8422

February 19, 1991

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS iii

I INTRODUCTION 1

II BACKGROUND 2

A. Site Description 2
B. Evaluation of Site History 2

III FIELD INVESTIGATION 4

A. Surface Soil Sampling 4
B. Drilling Soil Borings 4

IV CHEMICAL ANALYSIS 6

A. Surface Soil Samples 6
B. Soil Borings 6

V FINDINGS AND CONCLUSIONS 8

A. Soil and Groundwater Conditions 8
B. Results of Chemical Analysis 8
C. Conclusions 12

VII ILLUSTRATIONS 13

Appendices

A LABORATORY REPORTS

DISTRIBUTION

LIST OF ILLUSTRATIONS

Plate	1	Study Area Map
Plate	2	Site Plan
Plates through	3 6	Log of Borings B-1 to B-4
Plate	7	Soil Classification Chart

I INTRODUCTION

This report presents the results of a Phase II Preliminary Site Assessment (PSA) including soil sampling and chemical analysis performed by Harding Lawson Associates (HLA) for the properties located near Seventh and Natoma streets in San Francisco, California (Plate 1). As part of HLA's preliminary site assessment, we prepared a report entitled *Phase I Preliminary Hazardous Materials Site Assessment, Seventh and Natoma Streets, San Francisco, California*, dated January 3, 1991 that describes the potential hazardous chemical constituents that may have impacted the soil and groundwater at the subject properties. This work was performed for the San Francisco Redevelopment Agency (SFRA), who is considering purchasing and developing the property. The SFRA plans to construct a 5-story building for residential use. The proposed building is expected to have a below grade parking level and will likely require a pile foundation.

The purpose of this investigation was to evaluate if hazardous materials including metals, total petroleum hydrocarbons (TPH) and polynuclear aromatic hydrocarbons (PNAs) are present in the soil that is expected to be disturbed during construction. The scope of work for our soil sampling and chemical analysis was based on the findings of our Phase I PSA and discussions with the SFRA and San Francisco Department of Public Health (SFDPH). This investigation was authorized by Mr. William Nakamura of the SFRA and was performed in accordance with the existing contract with the SFRA. This investigation consisted of the following tasks:

- Drilling four borings and collecting soil samples for chemical analysis
- Analyzing selected soil samples for lead, TPH, PNAs, and 17 Metals
- Evaluating the results of soil sampling and chemical analysis and preparing this report.

II BACKGROUND

A. Site Description

The site is within San Francisco City Block 3726 and comprises Lots 33, 34, 35, 36, 37, and 37A (Plate 2). The site is currently unoccupied. Lots 33, 36, 37, and 37A are undeveloped and soil containing construction debris (fill) is exposed on the ground surface. A concrete basement slab and basement walls are located on Lot 34. Lot 35 is occupied by a three story building. Concrete floor slabs from previous buildings are suspect beneath the fill on Lots 36 and 37.

Most of the current site lots are approximately 6 feet below the existing sidewalk along Natoma Street. However, an access ramp exists along the northern property line of Lot 36. The grade of Lot 33 ranges from approximately sidewalk level along the western property line to a depth of approximately 6 feet near the eastern boundary of the lot. The basement slabs on Lots 34 and 35 are approximately 10 feet lower than the sidewalk level.

B. Evaluation of Site History

HLA investigated the site and site conditions previously as documented in our Phase I preliminary site assessment report. The Phase I report included an evaluation of the site history, review of published regulatory records concerning the site and surrounding area, and a preliminary field investigation, which included the collection of surface soil samples from the site.

In summary, we concluded that the site had been occupied by homes and businesses since at least 1887, and that former operations on the site may have utilized hazardous materials such as lead, glues, solvents, or dyes. We judged the likeliness of onsite disposal of these hazardous materials to be low, however, we identified a number

of sites within one quarter mile of the subject property that stored hazardous materials, had underground storage tanks (USTs), or were under investigation for known or suspected fuel or toxic leaks. We concluded that the soil or groundwater under the subject site may have been impacted by petroleum hydrocarbons from offsite USTs, coal tar waste from the former nearby coal gasification plant, and from elevated lead concentrations that are commonly detected in fill that has been placed along the San Francisco waterfront.

III FIELD INVESTIGATION

A. Surface Soil Sampling

As part of the Phase I PSA, HLA collected three near-surface soil samples on December 13, 1990 to provide a preliminary evaluation regarding lead and PNA contamination. Plate 2 shows the surface sample locations.

The soil samples were collected in stainless steel tubes at a depth of approximately 0.5 feet. The ends of the tubes were covered with Teflon and plastic caps and were stored in an iced cooler until delivery under chain-of-custody procedures to Eureka Laboratory (Eureka) in Sacramento, California.

B. Drilling and Sampling

In January 1991, HLA drilled and sampled four borings at the site (Plate 2) to evaluate the subsurface soil conditions. On January 11, 1991 HLA drilled Boring (B-4) in the basement of the former light fixture building (Plate 2). An HLA geologist drilled the boring using hand auger equipment. A soil sample was collected at a depth of 4 feet below the floor using a 6-inch long stainless steel tube. The tube was sealed with Teflon and plastic caps and stored in an iced cooler for delivery to Eureka.

HLA drilled and collected soil samples in three Borings (B-1 through B-3) on January 14, 1991. The borings were drilled using a truck-mounted drill rig equipped with 8-inch-diameter, hollow-stem flight augers. The logs of the borings are presented on Plates 3 through 6. The soils have been described in accordance with the ASTM/Unified Soil Classification System (Plate 7) by an HLA geologist. Soil samples were obtained using a 2-1/2 inch I.D. Sprague and Henwood (S&H) split-barrel sampler lined with stainless steel tubes. Soil samples which were retained were sealed at both ends with Teflon, plastic caps, and electrical tape. These tubes were then stored on

ice or in a refrigerator until delivery to Eureka. The logs also include the blow counts obtained during sampling; the S&H blow counts have been converted to pseudo standard penetration test (SPT)* blow counts using a conversion factor of 0.6.

The soil samples were screened in the field with an HNu model 101 photoionization detector (PID) that indicates the relative concentrations of volatile organic compounds in the soil. The results of the PID screening are presented on the boring logs.

---

* The SPT N-value is defined as the number of blows of a 140-pound hammer, falling freely through the height of 30 inches, required to drive a standard split-barrel sampler (2-inch outside diameter, 1-3/8-inch shoe inside diameter, and 1-1/2-inch tube inside diameter) the last 12 inches of an 18-inch drive. For SPT procedures, see ASTM D1586-84.

IV CHEMICAL ANALYSIS

A. Surface Soil Samples

The three discrete surface soil samples SS-1, SS-2, and SS-3 were analyzed for total lead using EPA Test Method 6010. Eureka Laboratory also composited the three samples and analyzed the composite sample for PNAs using EPA Test Method 8100.

On January 15, 1991 HLA requested that one of the surface soil samples, SS-2, be analyzed for soluble lead by EPA Test Method 7421 and California Title 22 Waste Extraction Test (WET).

B. Subsurface Soil Samples

The analysis for the soil samples collected from the borings consisted of the following:

- Total lead using EPA Test Method 6010
- PNAs by using EPA Test Method 8100
- Total Petroleum Hydrocarbons (TPH) as gasoline and diesel using Modified EPA Test Method 8015
- 17 Metals using EPA Test Method 6010

Soil samples were selected on the basis of PID readings, soil types, and discussions with Ms. Pamela Hollis of the San Francisco Department of Public Health (DPH). Table 1 outlines the selected analyses for soil samples.

Table 1. Results of Soil Sample Analyses
7th and Natoma Streets
2222,055.04

		Analysis Requested				
Boring No.	Depth (ft.)	TPH	Total Lead	Soluble Lead	PNAs	17 Metals
SS-1	0.5		X			
SS-2	0.5		X	X		
SS-3	0.5		X			
B-1	2.0					X
B-1	4.5		X		X	
B-1	9.0	X	X		X	
B-2	1.5		X			
B-2	10	X				
B-3	6.0		X			
B-3	10.5	X	X			
B-4	4.0	X	X			

TPH = Total petroleum hydrocarbons as gasoline and oil
PNAs = Polynuclear aromatic hydrocarbons

V FINDINGS AND DISCUSSION

A. Soil and Groundwater Conditions

Up to 10 feet of fill was encountered in our borings. The upper fill is distinguished by the presence of concrete, brick, and construction debris within the soil matrix. A layer of brown poorly graded sand with no construction debris was encountered below the upper fill. HLA judges the brown sand may be fill and it extends to a depth of approximately 10 feet below current site grade. A grey sand layer underlies the brown sand layer. Boring B-1 encountered a peat layer at a depth of approximately 9 feet. The peat layer is indicative of the former marshy conditions along San Francisco Bay in this area. No peat was encountered in the other borings.

Groundwater was encountered in Borings B-1, B-2, and B-3 at a depth of approximately 8 to 8.5 feet (approximately 14 feet below street grade). Groundwater was encountered in B-4 at 3.5 feet below the basement floor. The direction of groundwater flow is presumed to be generally south to southeast as determined from topography, historical shoreline maps, and proximity to San Francisco Bay.

B. Results of Chemical Analyses

The following sections discuss the results of chemical analyses. The laboratory reports are presented in Appendix A.

1. Total and Soluble Lead

Table 2 presents the results of chemical analyses for total and soluble lead in the soil samples. Total lead concentrations in the soil samples ranged from 4.7 to 1290 parts per million (ppm). The lead concentration detected in surface sample SS-3 (1290 ppm) exceeds the Total Threshold Limit Concentration (TTLC) of 1000 ppm as listed in Title 22 of the California Code of Regulations (CCR). Title 22 sets hazardous

waste criteria within the State. Since the SS-3 total lead concentration exceeded the TTLC, the soil may be classified as hazardous waste if it were to be excavated. The soluble lead concentrations detected in soil sample SS-2 (20.8 ppm) exceeded the Soluble Threshold Limit Concentration (STLC) of 5 ppm for lead as listed in Title 22. Samples SS-2 and SS-3 consisted of soil with construction debris. Therefore, the soil with construction debris exceeds the State hazardous waste criteria based on the total and soluble lead concentrations. No other samples were analyzed for soluble lead. Samples of brown and grey sand contain concentrations of total lead below the TTLC value and HLA judges that the soluble lead concentration of the sand is below the STLC. The source of lead detected in the fill is likely from lead-containing paint and other debris that may have been incorporated in the fill following the 1906 earthquake and fire.

Table 2. Results of Chemical Analyses for Lead
7th and Natoma Streets
(Concentrations in parts per million [ppm])

Sample No.	Depth	Total Lead	Soluble Lead
SS-1	0.5	9.1	NA
SS-2	0.5	348	20.8
SS-3	0.5	1290	NA
B-1	4.5	5.0	NA
B-1	9.0	4.7	NA
B-2	1.5	340	NA
B-3	6.0	5.6	NA
B-3	10.5	7.5	NA
B-4	4.0	5.5	NA

NA - Not Analyzed

2. Polynuclear Aromatic Hydrocarbons (PNAs)

Table 3 presents results of the PNA analyses. No PNAs were detected in the soil sample collected from Boring B-1 at 4.5 feet. One PNA compound (pyrene) was

detected in a soil sample collected from Boring B-1 at 9.0 feet in concentration of 446 parts per billion (ppb). It is HLA's experience that PNAs are common in fill materials along the historic margins of San Francisco Bay. The pyrene may be associated with the movement of contaminated groundwater. The source of the pyrene may be wastes from coal-gasification plants that were located throughout the San Francisco waterfront in the late 1800s or from creosote treated timber. However, the exact source or extent of the pyrene is undetermined.

Table 3. Results of Chemical Analyses for PNAs
7th and Natoma streets
(Concentrations in parts per billion [ppb])

Sample No.	Depth	Result
Composite Sample (SS-1, SS-2, SS-3)	0.5	None Detected
B-1	4.5	None Detected
B-1	9.0	446 as pyrene

PNAs are generally regulated as a group of chemical constituents consisting of a least 23 discrete chemical compounds. On the basis of the pyrene concentration, the soil may be classified as a hazardous waste per Title 22 of the CCR if the soil is excavated and removed from the site.

3. Total Petroleum Hydrocarbons (TPH)

No concentrations of TPH as gasoline were detected in any of the five soil samples analyzed. Based on the results of the Phase 1 PSA investigation, HLA recommends that observations be made during any mass excavation prior to construction to assess if hydrocarbon contamination is present within any excavated material. If field observations indicate that hydrocarbons are present, the soil should be stockpiled and analyzed prior to disposal or remediation.

4. 17 Metals

Table 4 presents the results of chemical analyses of one sample for 17 metals and the respective TTLC and STLC values. The soil sample, B-1 at 2 feet, was analyzed for the 17 metals at the request of Pamela Hollis of the SFDPH because elevated concentrations of metals have been detected in samples of fill from other sites in San Francisco.

Table 4. Results of Chemical Analyses for CAM-17 Metals (B-1 at 2 feet)

Metal	Concentration (ppm)	STLC	TTLC
Antimony	3.9	15	500
Arsenic	ND<1.0	5	500
Barium	197	100	10,000
Beryllium	ND<0.5	0.75	75
Cadmium	1.4	1.0	100
Cobalt	6.6	80	8,000
Chromium	39.0	560*	2,500*
Copper	80.0	25	2500
Mercury	ND<1.0	0.2	20
Molybdenum	ND<1.0	350	3,500
Nickel	20.6	20	2,000
Lead	274	5	1,000
Selenium	3.1	1.0	100
Silver	ND<0.5	5	500
Thallium	ND<1.0	7.0	700
Vanadium	25.0	24	2,400
Zinc	462	250	5,000

All results in ppm
* = Value for chromium III
STLC = Soluble Threshold Limit Concentration
TTLC = Total Threshold Limit Concentration
ND<1.0 = Not detected at reported limit

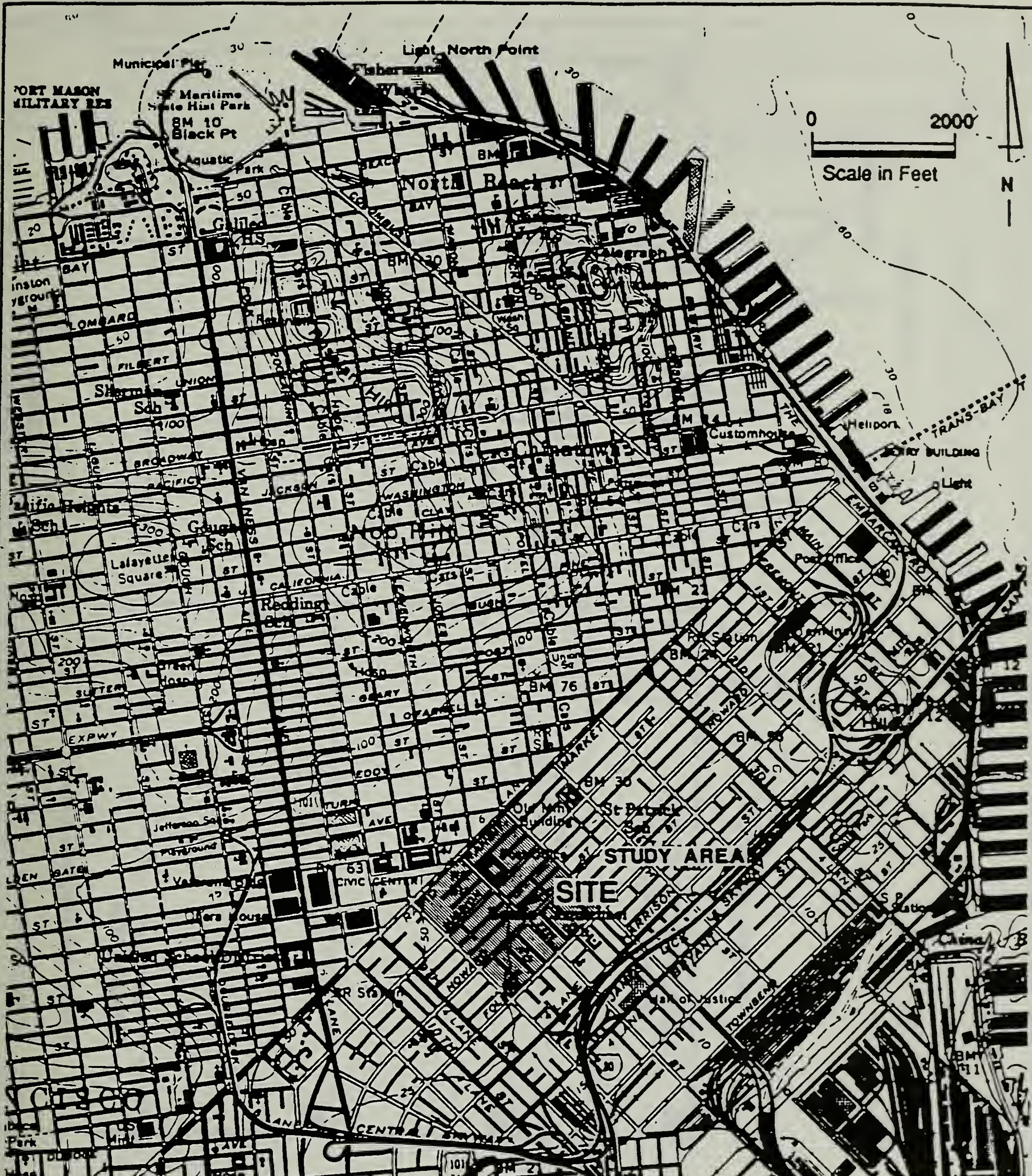
No concentrations of the 17 metals were detected in the soil sample in excess of the TTLC. The lead concentration, 274 ppm, is in the same range as lead concentrations from the other surface samples and from the sample from Boring B-2 at 1.5 feet. The

metal concentrations are within the normal range of values for fill with construction debris in San Francisco.

C. Conclusions

In conclusion, HLA estimates that 800 to 1,400 cubic yards of soil with construction debris and elevated lead concentrations exists on Lots 33, 36, 37, and 37A. Underlying the fill with construction debris, a grey sand layer near the water is suspected of containing pyrene and possibly other PNAs. The extent of the pyrene/PNA contamination is undetermined. No TPH was detected in the analyzed soil samples. The presence of lead and PNAs in fill along the San Francisco waterfront is common and not limited specifically to the subject properties. Therefore, HLA judges that future construction is feasible although mitigative measures to protect public health may be necessary.

VII ILLUSTRATIONS



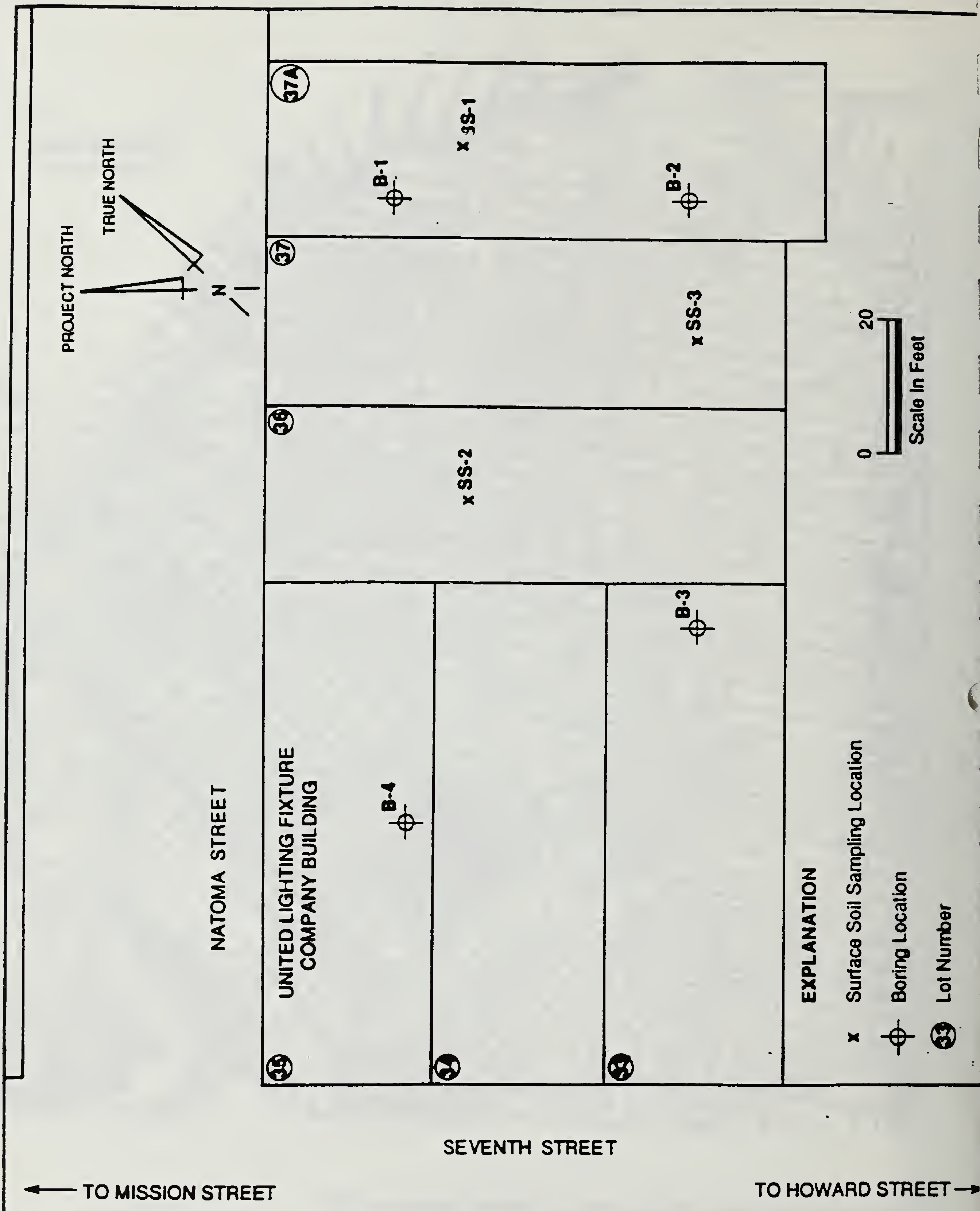
Base Map: USGS, San Francisco North, 7.5 Minute Quadrangle, 1973

Harding Lawson Associates
Engineering and
Environmental Services

Study Area Map
7th and Natoma Streets
San Francisco, California

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AM	2222,055.04	TLD	1/91	



Harding Lawson Associates
Engineering and
Environmental Services

Site Plan
Seventh and Natoma Project Site
San Francisco, California

PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AM	2222,055.04	TLD	1/91	

Equipment 8" Hollow Stem Auger

Elevation -6.0 ft Date 1/14/91

Laboratory Tests	Blows/ft	Odor	HNu (ppm)	Depth ft
		No	0	
	15	No	0	5
		No	0	
	29	Slgt	0	10
	12	No	0	
				15
				20
				25
				30
				35
				40

DARK BOWN SILTY SAND (SM)
(WITH CONSTRUCTION DEBRIS)

bottom of former basement slab at 3'

FILL

BROWN SAND WITH SILT (SP-SM)
medium dense, moist

POSSIBLE FILL

water level on 1/14/91
becomes gray at 9'

BLACK PEAT (PT)
slight organic odor

DARK GRAY SAND WITH SILT (SP-SM)
medium dense, saturated

5 feet of heave

Boring was terminated at 18.5 feet.
Groundwater was encountered at 8.5 feet.

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring B-1 (sheet 1 of 1)
7th and Natoma
San Francisco, California

PLATE 3

10156G16 | JOB NUMBER 2222,055.04 | APPROVED TLO | DATE 2/91 | REVISED DATE

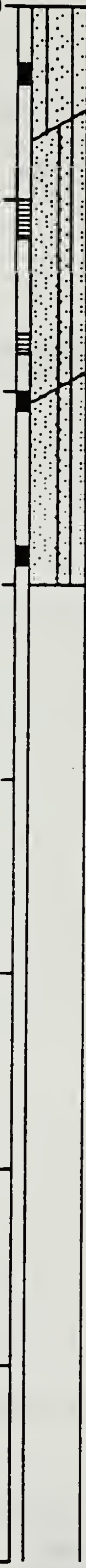
DIETERICH-POST 130713

Equipment 8" Hollow Stem Auger

Elevation -6.5 ft Date 1/14/91

Laboratory Tests	Blows/ft	Odor	HNu (ppm)	Depth ft	
				0	DARK BROWN SILTY SAND (SM) (WITH CONSTRUCTION DEBRIS)
		No	0		
					BROWN SAND WITH SILT (SP-SM) medium dense, moist
	30/5"			5	brick fragments at 5 feet
					water level 1/14/91
	15				
					brick and concrete fragments
	19/9"	No	0	10	BROWN SILTY SAND (SP-SM) medium dense, saturated color change at 12 feet to dark gray
		No	0		
				15	Boring was terminted at 15 feet. Groundwater was encountered at 8 feet.
				20	
				25	
				30	
				35	
				40	

FILL (0 to 10.5 ft)



Harding Lawson Associates
Engineering and Environmental Services

Log of Boring B-2 (sheet 1 of 1)
7th and Natoma
San Francisco, California

PLATE 4

10156G16 | JOB NUMBER 2222,055.04 | APPROVED TLO | DATE 2/91 | REVISED DATE

Equipment 8" Hollow Stem Auger

Elevation -6.0 ft Date 1/14/91

Laboratory Tests	Blows/ft	Odor	HNu (ppm)	Depth ft	Description
				0	BROWN SAND WITH SILT (SP-SM) medium dense, moist
				5	POSSIBLE FILL
	22	No	0		drilling easier at 7 feet
					water level 1/14/91
				10	color change to gray at 10 feet
	23	No	0		
		No	0		5 feet of heave
				15	Boring was terminated at 15 feet. Groundwater was encountered at 8.5 feet.
				20	
				25	
				30	
				35	
				40	

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring B-3 (sheet 1 of 1)
7th and Natoma
San Francisco, California

PLATE 5

10156G16 JOB NUMBER 2222,055.04 APPROVED TLO DATE 2/91 REVISED DATE

DIETERICH-POST 136713

Equipment 8" Hollow Stem Auger

Elevation -11.0 ft Date 1/11/91

Laboratory Tests	Blows/ft	Odor	HNu (ppm)	Depth ft	Sample	
				0		6" CONCRETE DARK BROWN SAND WITH SILT (SP-SM) loose, moist
		No	0			
		No	0			becomes medium dense at 3.5 feet water level on 1/11/91
		No	0			FILL
				5		Boring was terminated at 4.5 feet. Groundwater was encountered at 3.5 feet.
				10		
				15		
				20		
				25		
				30		
				35		
				40		

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring B-4 (sheet 1 of 1)
7th and Natoma
San Francisco, California

PLATE 6

10156G16

JOB NUMBER 2222,055.04

APPROVED TLD

DATE 2/91

REVISED DATE

138230

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2487-85

MAJOR DIVISIONS					GROUP NAMES
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	Clean gravels less than 5% fines	GW		WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND
			GP		POORLY-GRADED GRAVEL, POORLY-GRADED GRAVEL WITH SAND
		Gravels with more than 12% fines	GM		SILTY GRAVEL, SILTY GRAVEL WITH SAND
			GC		CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
	SANDS 50% or more of coarse fraction passes No. 4 sieve	Clean sand less than 5% fines	SW		WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL
			SP		POORLY-GRADED SAND, POORLY-GRADED SAND WITH GRAVEL
		Sands with more than 12% fines	SM		SILTY SAND, SILTY SAND WITH GRAVEL
			SC		CLAYEY SAND, CLAYEY SAND WITH GRAVEL
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50%		ML		SILT, SILT WITH SAND OR GRAVEL, SANDY OR GRAVELLY SILT
			CL		LEAN CLAY, LEAN CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY LEAN CLAY
			OL		ORGANIC SILT OR CLAY, ORGANIC SILT OR CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY ORGANIC SILT OR CLAY
	SILTS AND CLAYS Liquid limit 50% or more		MH		ELASTIC SILT, ELASTIC SILT WITH SAND OR GRAVEL, SANDY OR GRAVELLY ELASTIC SILT
			CH		FAT CLAY, FAT CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY FAT CLAY
			OH		ORGANIC SILT OR CLAY, ORGANIC SILT OR CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY ORGANIC SILT OR CLAY
HIGHLY ORGANIC SOILS			Pt		PEAT

For definition of dual and borderline symbols, see ASTM D2487-85.

KEY TO TEST DATA

Perm	-	Permeability
Consol	-	Consolidation
LL	-	Liquid Limit (%)
PI	-	Plasticity Index (%)
Gs	-	Specific Gravity
MA	-	Particle Size Analysis
▮	-	"Undisturbed" Sample
▧	-	Bulk or Classification Sample
▤	-	Lost Sample

	Shear Strength (psf)	Confining Pressure	
TxUU	3200	(2600)	- Unconsolidated-Undrained Triaxial Shear
	(FM) or (S)		(field moisture or saturated)
TxCU	3200	(2600)	- Consolidated-Undrained Triaxial Shear
	(P)		(with or without pore pressure measurement)
TxCD	3200	(2600)	- Consolidated Drained Triaxial Shear
SSCU	3200	(2600)	- Simple Shear Consolidated Undrained
	(P)		(with or without pore pressure measurement)
SSCD	3200	(2600)	- Simple Shear Consolidated Drained
DSCD	2700	(2000)	- Consolidated Drained Direct Shear
UC	470		- Unconfined Compression
LVS	700		- Laboratory Vane Shear
TV	800		- Torvane Shear
PP	400		- Pocket Penetrometer
			(actual reading divided by 2)

Harding Lawson Associates
Engineering and Environmental Services

Soil Classification Chart and Key to Test Data
7th and Natoma
San Francisco, California

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AM	2222,055.04	TLO	1/91	

Appendix A

LABORATORY REPORTS

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis,
Research & Testing
Environmental Studies
Robotics
Toxicology

January 2, 1991

Mr. Jim Ordons
HARDING LAWSON ASSOCIATES
303 2nd Street, Suite 630N
San Francisco, CA 94105

RECEIVED
JAN 7 1991
Harding Lawson Associates

Reference: Job #: 2222.055.04
Location: 7th & Natoma
ELI No.: 90-12-165

Dear Mr. Ordons:

Eureka Laboratories, Inc. is pleased to submit a laboratory report for the subject task. This report presents analytical results for three (3) soil samples for the following analyses:

ANALYSIS	METHOD	SAMPLE ID.
Polynuclear Aromatic Hydrocarbons	EPA 8100	SS-1, SS-2, SS-3
Total Lead	EPA 6010	same as above

Sincerely,

EUREKA LABORATORIES, INC.

By:
Shao-Pin Yo, Ph.D.
Laboratory Director

SPY/jb

Attachment

TOTAL LEAD
EPA 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 90-12-165
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222.055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 12/14/1990
DATE EXTRACTED: 12/18/1990
DATE COMPLETED: 12/27/1990
DATE SAMPLED: 12/13/1990

SAMPLE ID.	UNITS [mg/Kg (ppm)]
SS-1	9.1
SS-2	348
SS-3	1290
Method Blank	<3.0

Matrix Spike Recovery * - 75%
Matrix Spike Recovery Duplicate * - 74%

* This set of matrix spike is from another sample of the same matrix and of the same analytical batch.

This detection limit is based on the dilution factor of 50.

Detection Limit: 3.0 [mg/Kg (ppm)]

Josie Quiambao
Josie Quiambao
Chemist

January 2, 1991
Date

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: SS-1,SS-2,SS-3 (COMP 3)

DATE SAMPLED: 12/13/90
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90
DILUTION FACTOR: 2.00

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.14	.14
208-96-8	Acenaphthylene	<.14	.14
120-12-7	Anthracene	<.14	.14
56-55-3	Benzo(a)athracene	<.14	.14
50-32-8	Benzo(a)pyrene	<.28	.28
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.14	.14
191-24-2	Benzo(g,h,i)perylene	<.28	.28
218-01-9	Chrysene	<.14	.14
53-70-3	Dibenzo(a,h)anthracene	<.28	.28
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.14	.14
86-73-7	Fluorene	<.14	.14
193-39-5	Indeno(1,2,3-cd)pyrene	<.28	.28
	3-Methylcholanthrene	<.80	.80
91-20-3	Naphthalene	<.14	.14
85-01-8	Phenanthrene	<.14	.14
129-00-0	Pyrene	<.60	.60
	Dibenzo(a,i)pyrene	<.60	.60
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.
Higher detection limit is due to matrix interference.

Chemist Mark Shih

Mark Shih, Ph.D.

12/27/90
Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC. 6790 Florin Perkins Road Sacramento, CA 95828 (916)381-7953	Order No.: 90-12-165 Hazardous Waste Testing Certification No.: E765
CLIENT: HARDING LAWSON ASSOCIATES REPORT UNIT: ppm (mg/Kg) SAMPLE LOCATION: SAMPLE ID: METHOD BLANK	DATE SAMPLED: DATE RECEIVED: 12/14/90 DATE EXTRACTED: 12/26/90 DATE COMPLETED: 12/27/90 DILUTION FACTOR: 1.0

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.07	.07
208-96-8	Acenaphthylene	<.07	.07
120-12-7	Anthracene	<.07	.07
56-55-3	Benzo(a)athracene	<.07	.07
50-32-8	Benzo(a)pyrene	<.14	.14
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.07	.07
191-24-2	Benzo(g,h,i)perylene	<.14	.14
218-01-9	Chrysene	<.07	.07
53-70-3	Dibenzo(a,h)anthracene	<.14	.14
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.07	.07
86-73-7	Fluorene	<.07	.07
193-39-5	Indeno(1,2,3-cd)pyrene	<.14	.14
	3-Methylcholanthrene	<.40	.40
91-20-3	Naphthalene	<.07	.07
85-01-8	Phenanthrene	<.07	.07
129-00-0	Pyrene	<.30	.30
	Dibenzo(a,i)pyrene	<.30	.30
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist [signature] 12/27/90

Mark Shih, Ph.D. Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: REAGENT SPIKE RECOVERY

DATE SAMPLED:
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90

CAS#	COMPOUND	RESULT
83-32-9	Acenaphthene	91%
208-96-8	Acenaphthylene	94%
120-12-7	Anthracene	106%
56-55-3	Benzo(a)athracene	105%
50-32-8	Benzo(a)pyrene	117%
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	114%
191-24-2	Benzo(g,h,i)perylene	112%
218-01-9	Chrysene	NA
53-70-3	Dibenzo(a,h)anthracene	NA
	Dibenz(a,j)acridine	NA
206-44-0	Fluoranthene	100%
86-73-7	Fluorene	91%
193-39-5	Indeno(1,2,3-cd)pyrene	NA
	3-Methylcholanthrene	NA
91-20-3	Naphthalene	88%
85-01-8	Phenanthrene	82%
129-00-0	Pyrene	103%
	Dibenzo(a,i)pyrene	NA
	Benzo(j)fluoranthene	NA
	Dibenz(a,h)acridine	NA
	7H-Dibenzo(c,g)carbazole	NA
	Dibenzo(a,e)pyrene	NA
	Dibenzo(a,h)pyrene	NA

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.
Reagent spike set is used due to matrix interference.

Chemist Mark Shih
Mark Shih, Ph.D.

12/27/90
Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 90-12-165
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: REAGENT SPIKE RECOVERY DUP

DATE SAMPLED:
DATE RECEIVED: 12/14/90
DATE EXTRACTED: 12/26/90
DATE COMPLETED: 12/27/90

CAS#	COMPOUND	RESULT
83-32-9	Acenaphthene	**94%**
208-96-8	Acenaphthylene	**97%**
120-12-7	Anthracene	**106%**
56-55-3	Benzo(a)athracene	**100%**
50-32-8	Benzo(a)pyrene	**113%**
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	**102%**
191-24-2	Benzo(g,h,i)perylene	**108%**
218-01-9	Chrysene	**NA**
53-70-3	Dibenzo(a,h)anthracene	**NA**
	Dibenz(a,j)acridine	**NA**
206-44-0	Fluoranthene	**100%**
86-73-7	Fluorene	**96%**
193-39-5	Indeno(1,2,3-cd)pyrene	**NA**
	3-Methylcholanthrene	**NA**
91-20-3	Naphthalene	**90%**
85-01-8	Phenanthrene	**82%**
129-00-0	Pyrene	**103%**
	Dibenzo(a,i)pyrene	**NA**
	Benzo(j)fluoranthene	**NA**
	Dibenz(a,h)acridine	**NA**
	7H-Dibenzo(c,g)carbazole	**NA**
	Dibenzo(a,e)pyrene	**NA**
	Dibenzo(a,h)pyrene	**NA**

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.
Reagent spike set is used due to matrix interference.

Chemist Mark Shih
Mark Shih, Ph.D.

12/27/90
Date

NA=NOT AVAILABLE

HLA
Harding Lawson Associates
303 ... Street, Suite 630N
San ...cisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

15150
90.12.165

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222.055.04
Name/Location: 7TH & Natoma
Project Manager: A Ordons

Samplers: A Ordons

Recorder: A Ordons (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	PNAs EPA E(U)	(Composite 3 samples)
			X					1	SS-	1		90	12	13		Surface Soil							X		
									SS-	2						Samples							X		
									SS-	3													X		
																Composite SS-1,2,3								X	
																for PNA analysis									

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
A Ordons	[signature]	12/13 330
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) [signature]	DATE/TIME 12/14 1200

METHOD OF SHIPMENT: Concord Courier

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis,
Research & Testing
Environmental Studies
Robotics
Toxicology

January 30, 1991

Mr. Jim Ordons
HARDING LAWSON ASSOCIATES
303 2nd Street, Suite 630N
San Francisco, CA 94105

RECEIVED
FEB 01 1991
Harding Lawson Associates

Reference: ReOrder of : 90-12-165
ELI Order #: 91-01-114

Dear Mr. Ordons:

Eureka Laboratories, Inc. is pleased to submit a laboratory report for the subject task. This report presents analytical results for one (1) soil sample for the following analysis:

ANALYSIS	METHOD	SAMPLE ID.
STLC/Lead	EPA 7421	SS-2
California Waste Extraction Test (WET)	Title 22	same as above

Sincerely,
EUREKA LABORATORIES, INC.

By: Shao-Pin Yo
Shao-Pin Yo, Ph.D.
Laboratory Director

SPY/jj

Attachment

STLC/LEAD
EPA 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-114
Hazardous Waste Testing
Certification: E765

CLIENT: HLA
REORDER OF: 90-12-165

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: 01/21/1991
DATE ANALYZED: 01/28/1991

SAMPLE ID.	UNITS [mg/L (ppm)]
SS-2	20.8
METHOD BLANK	<0.50
DETECTION LIMIT	0.50 *

This detection limit reflects a dilution factor of 10.

SS-2 MATRIX SPIKE RECOVERY - 88%
SS-2 MATRIX SPIKE RECOVERY DUP. - 90%

Jim Mentessi
Jim Mentessi
Chemist

January 30, 1991
Date

EUREKA LABORATORIES, INC.

6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
LAB: (916) 381-9357
FAX: (916) 381-4013

CLIENT: HLA · SF
CONTACT: Jim Ordorb
TELEPHONE: (415) 543-8422

BB-5

PROJECT REF. #	ELI ORDER #	PROJECT NAME
	91.01.114	re-order of 90.12.165

SAMPLERS (Signature)

ANALYSIS REQUIRED: soluable Pb (STLC) per tel conversation with Mark (i.e. Jim's place)

CLIENT SAMPLE ID	SAMPLE LOCATION	COMP.	GRAB	DATE/TIME	CONTAINER TYPE	soluable Pb (STLC)	TYPE OF PRESERVATIVE USED	CONTAINER CONDITION	COMMENTS
38-2					soil	X			

recieved the request by phone 1/15/91 10:00 am

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED FOR LABORATORY BY: (Signature)	DATE/TIME
		[illegible signature]	1/15/91 10:00 am

ELI SM-01

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis
Research & Testing
Environmental Studies
Robotics
Toxicology

January 30, 1991

Mr. J. Ordons
HARDING LAWSON ASSOCIATES
303 2nd Street, Suite 630N
San Francisco, CA 94105

RECEIVED
FEB 05 1991
Harding Lawson Associates

Reference: Job #: 2222,055.04
Location: 7th & Natoma
ELI No: 91-01-116

Dear Mr. Ordons:

Eureka Laboratories, Inc. is pleased to submit a laboratory report for the subject task. This report presents analytical results for eighteen (18) miscellaneous samples for the following analyses:

ANALYSIS	METHOD	SAMPLE ID.
Polynuclear Aromatic Hydrocarbons	EPA 8100	B1@4.5', B1@9'
Total Petroleum Hydrocarbons	EPA 8015 (modified)	B-4, B3@6', B3@10.5', B1@9', B2@10'
TTLC/CAM Metals	EPA 6010	B1@2
Lead	EPA 6010	B-4, B3@6', B3@10.5', B1@4.5', B1@9', B2@1.5
Asbestos Hydrocarbons	EPA PUB. 600/M4-82-020	7N-009, 7N-010, 7N-011, 7N-012, 7N-013, 7N-014, 7N-015, 7N-016, 7N-017, 7N-018

Sincerely,

EUREKA LABORATORIES, INC.

By: Shao-Pin Yo
Shao-Pin Yo, Ph.D.
Laboratory Director

SPY/jb

Attachment

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: METHOD BLANK

DATE SAMPLED:
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 1/17/91
DATE COMPLETED: 1/22/91
DILUTION FACTOR: 1.0

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.07	.07
208-96-8	Acenaphthylene	<.07	.07
120-12-7	Anthracene	<.07	.07
56-55-3	Benzo(a)athracene	<.07	.07
50-32-8	Benzo(a)pyrene	<.14	.14
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.07	.07
191-24-2	Benzo(g,h,i)perylene	<.14	.14
218-01-9	Chrysene	<.07	.07
53-70-3	Dibenzo(a,h)anthracene	<.14	.14
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.07	.07
86-73-7	Fluorene	<.07	.07
193-39-5	Indeno(1,2,3-cd)pyrene	<.14	.14
	3-Methylcholanthrene	<.40	.40
91-20-3	Naphthalene	<.07	.07
85-01-8	Phenanthrene	<.07	.07
129-00-0	Pyrene	<.30	.30
	Dibenzo(a,i)pyrene	<.30	.30
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist [signature] 01/22/91
Mark Shih, Ph.D. Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B1@ 4.5'

DATE SAMPLED: 01/14/91
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 1/17/91
DATE COMPLETED: 1/22/91
DILUTION FACTOR: 1.0

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.07	.07
208-96-8	Acenaphthylene	<.07	.07
120-12-7	Anthracene	<.07	.07
56-55-3	Benzo(a)athracene	<.07	.07
50-32-8	Benzo(a)pyrene	<.14	.14
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.07	.07
191-24-2	Benzo(g,h,i)perylene	<.14	.14
218-01-9	Chrysene	<.07	.07
53-70-3	Dibenzo(a,h)anthracene	<.14	.14
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.07	.07
86-73-7	Fluorene	<.07	.07
193-39-5	Indeno(1,2,3-cd)pyrene	<.14	.14
	3-Methylcholanthrene	<.40	.40
91-20-3	Naphthalene	<.07	.07
85-01-8	Phenanthrene	<.07	.07
129-00-0	Pyrene	<.30	.30
	Dibenzo(a,i)pyrene	<.30	.30
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist Mark Shih
Mark Shih, Ph.D.

01/22/91
Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B1 @ 9'

DATE SAMPLED: 01/14/91
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 1/17/91
DATE COMPLETED: 1/22/91
DILUTION FACTOR: 1.0

CAS#	COMPOUND	RESULT	DET.LIMIT
83-32-9	Acenaphthene	<.07	.07
208-96-8	Acenaphthylene	<.07	.07
120-12-7	Anthracene	<.07	.07
56-55-3	Benzo(a)athracene	<.07	.07
50-32-8	Benzo(a)pyrene	<.14	.14
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	<.07	.07
191-24-2	Benzo(g,h,i)perylene	<.14	.14
218-01-9	Chrysene	<.07	.07
53-70-3	Dibenzo(a,h)anthracene	<.14	.14
	Dibenz(a,j)acridine		
206-44-0	Fluoranthene	<.07	.07
86-73-7	Fluorene	<.07	.07
193-39-5	Indeno(1,2,3-cd)pyrene	<.14	.14
	3-Methylcholanthrene	<.40	.40
91-20-3	Naphthalene	<.07	.07
85-01-8	Phenanthrene	<.07	.07
129-00-0	Pyrene	.446	.30
	Dibenzo(a,i)pyrene	<.30	.30
	Benzo(j)fluoranthene		
	Dibenz(a,h)acridine		
	7H-Dibenzo(c,g)carbazole		
	Dibenzo(a,e)pyrene		
	Dibenzo(a,h)pyrene		

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist [signature] 01/22/91
Mark Shih, Ph.D. Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: MATRIX SPIKE RECOVERY
B1@ 9'

DATE SAMPLED:
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/22/91

CAS#	COMPOUND	RESULT
83-32-9	Acenaphthene	60%
208-96-8	Acenaphthylene	62%
120-12-7	Anthracene	72%
56-55-3	Benzo(a)athracene	72%
50-32-8	Benzo(a)pyrene	75%
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	71%
191-24-2	Benzo(g,h,i)perylene	NA
218-01-9	Chrysene	63%
53-70-3	Dibenzo(a,h)anthracene	76%
	Dibenz(a,j)acridine	
206-44-0	Fluoranthene	72%
86-73-7	Fluorene	62%
193-39-5	Indeno(1,2,3-cd)pyrene	76%
	3-Methylcholanthrene	NA
91-20-3	Naphthalene	NA
85-01-8	Phenanthrene	68%
129-00-0	Pyrene	78%
	Dibenzo(a,i)pyrene	NA
	Benzo(j)fluoranthene	
	Dibenz(a,h)acridine	
	7H-Dibenzo(c,g)carbazole	
	Dibenzo(a,e)pyrene	
	Dibenzo(a,h)pyrene	

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist Mark Shih
Mark Shih, Ph.D.

01/22/91
Date

NA=NOT AVAILABLE

POLYNUCLEAR AROMATIC HYDROCARBONS
EPA Method 8100

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: MATRIX SPIKE RECOVERY DUP
B1 @ 9'

DATE SAMPLED:
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/22/91

CAS#	COMPOUND	RESULT
83-32-9	Acenaphthene	63%
208-96-8	Acenaphthylene	64%
120-12-7	Anthracene	67%
56-55-3	Benzo(a)athracene	61%
50-32-8	Benzo(a)pyrene	69%
205-99-2	*Benzo(b)fluoranthene and/or Benzo(k)fluoranthene	70%
191-24-2	Benzo(g,h,i)perylene	NA
218-01-9	Chrysene	57%
53-70-3	Dibenzo(a,h)anthracene	76%
	Dibenz(a,j)acridine	
206-44-0	Fluoranthene	70%
86-73-7	Fluorene	63%
193-39-5	Indeno(1,2,3-cd)pyrene	76%
	3-Methylcholanthrene	NA
91-20-3	Naphthalene	NA
85-01-8	Phenanthrene	64%
129-00-0	Pyrene	74%
	Dibenzo(a,i)pyrene	NA
	Benzo(j)fluoranthene	
	Dibenz(a,h)acridine	
	7H-Dibenzo(c,g)carbazole	
	Dibenzo(a,e)pyrene	
	Dibenzo(a,h)pyrene	

Note:
All positively identified compounds were second column confirmed.
* These two compounds co-elute.

Chemist Mark Shih
Mark Shih, Ph.D.

01/22/91
Date

NA=NOT AVAILABLE

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B-4

DATE SAMPLED: 01/11/91
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91
DILUTION FACTOR: 1.00

PETROLEUM HYDROCARBONS	RESULT	DETECTION LIMIT
Gasoline Range	<5	5
Diesel Range	<10	10
Motor Oil Range	<25	25
Total Petroleum Hydrocarbons		
CARBON NO. RANGE		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	
PEAK CARBON NO.		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	

Chemist *Mark Shih* — 01/18/91

Mark Shih, Ph.D. — Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B3 @ 6'

DATE SAMPLED: 01/14/91
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91
DILUTION FACTOR: 1.00

PETROLEUM HYDROCARBONS	RESULT	DETECTION LIMIT
Gasoline Range	<5	5
Diesel Range	<10	10
Motor Oil Range	<25	25
Total Petroleum Hydrocarbons		
CARBON NO. RANGE		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	
PEAK CARBON NO.		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	

Chemist Mark Shih
Mark Shih, Ph.D.

01/18/91
Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B3 @ 10.5'

DATE SAMPLED:
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91
DILUTION FACTOR: 1.00

PETROLEUM HYDROCARBONS	RESULT	DETECTION LIMIT
Gasoline Range	<5	5
Diesel Range	<10	10
Motor Oil Range	<25	25
Total Petroleum Hydrocarbons		
CARBON NO. RANGE		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	
PEAK CARBON NO.		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	

Chemist Mark Shih

Mark Shih, Ph.D.

01/18/91

Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B1 @ 9'

DATE SAMPLED: 01/14/91
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91
DILUTION FACTOR: 1.00

PETROLEUM HYDROCARBONS	RESULT	DETECTION LIMIT
Gasoline Range	<5	5
Diesel Range	<10	10
Motor Oil Range	<25	25
Total Petroleum Hydrocarbons		
CARBON NO. RANGE		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	
PEAK CARBON NO.		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	

Chemist Mark Shih
Mark Shih, Ph.D.

01/18/91
Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: B2 @ 10'

DATE SAMPLED: 01/14/91
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91
DILUTION FACTOR: 1.00

PETROLEUM HYDROCARBONS	RESULT	DETECTION LIMIT
Gasoline Range	<5	5
Diesel Range	<10	10
Motor Oil Range	<25	25
Total Petroleum Hydrocarbons		
CARBON NO. RANGE		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	
PEAK CARBON NO.		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	

Chemist Mark Shih
Mark Shih, Ph.D.

01/18/91
Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: ppm (mg/Kg)
SAMPLE LOCATION:
SAMPLE ID: METHOD BLANK

DATE SAMPLED:
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91
DILUTION FACTOR: 1.00

PETROLEUM HYDROCARBONS	RESULT	DETECTION LIMIT
Gasoline Range	<5	5
Diesel Range	<10	10
Motor Oil Range	<25	25
Total Petroleum Hydrocarbons		
CARBON NO. RANGE		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	
PEAK CARBON NO.		
Gasoline Range	-	
Diesel Range	-	
Motor Oil Range	-	

Chemist Mark Shih
Mark Shih, Ph.D.

01/18/91
Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC.
6790 Florin Perkins Road
Sacramento, CA 95828
(916)381-7953

Order No.: 91-01-116
Hazardous Waste Testing
Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES
REPORT UNIT: %
SAMPLE LOCATION:
SAMPLE ID: SPIKE RECOVERY
B-4

DATE SAMPLED:
DATE RECEIVED: 01/15/91
DATE EXTRACTED: 01/17/91
DATE COMPLETED: 01/17/91

PETROLEUM HYDROCARBONS	RESULT
Gasoline Range	96%
Diesel Range	NA
Motor Oil Range	97%
Total Petroleum Hydrocarbons	
CARBON NO. RANGE	
Gasoline Range	-
Diesel Range	-
Motor Oil Range	-
PEAK CARBON NO.	
Gasoline Range	-
Diesel Range	-
Motor Oil Range	-

Chemist Mark Shih
Mark Shih, Ph.D.

01/18/91
Date

TOTAL PETROLEUM HYDROCARBONS
MODIFIED EPA METHOD 8015 (GC-FID) FOR SOIL

EUREKA LABORATORIES, INC. 6790 Florin Perkins Road Sacramento, CA 95828 (916)381-7953	Order No.: 91-01-116 Hazardous Waste Testing Certification No.: E765

CLIENT: HARDING LAWSON ASSOCIATES	DATE SAMPLED:
REPORT UNIT: %	DATE RECEIVED: 01/15/91
SAMPLE LOCATION:	DATE EXTRACTED: 01/17/91
SAMPLE ID: SPIKE RECOVERY DUPLICATE B-4	DATE COMPLETED: 01/17/91

PETROLEUM HYDROCARBONS	RESULT
Gasoline Range	92%
Diesel Range	NA
Motor Oil Range	97%
Total Petroleum Hydrocarbons	
CARBON NO. RANGE	
Gasoline Range	-
Diesel Range	-
Motor Oil Range	-
PEAK CARBON NO.	
Gasoline Range	-
Diesel Range	-
Motor Oil Range	-

Chemist [signature]
Mark Shih, Ph.D.

01/18/91
Date

LEAD
EPA 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: 01/17/1991
DATE ANALYZED: 01/25/1991

SAMPLE ID.	DATE SAMPLED	LEAD [mg/Kg(ppm)]
B-4	01/11/91	5.5
B3@6'	01/14/91	5.6
B3@10.5'	01/14/91	7.5
B1@4.5'	01/14/91	5.0
B1@9'	01/14/91	4.7
B2@1.5	01/14/91	340
METHOD BLANK		<3.0

DETECTION LIMIT: 3.0 [mg/Kg(ppm)]

REAGENT SPIKE RECOVERY - 104%
REAGENT SPIKE RECOVERY DUP. - 102%

* Reagent spike set is used due to matrix interference.

Fox:
Josie Quiambao
Chemist

January 30, 1991
Date

TTLC/CAM Metals, EPA Method 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA
SAMPLE ID: B1@2'

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: 01/17/1991
DATE ANALYZED: 01/25/1991
DATE SAMPLED: 01/14/1991

	CONCENTRATION [mg/Kg (ppm)]	DETECTION LIMIT [mg/Kg (ppm)]
Silver	<0.5	0.5
Arsenic	<1.0	1.0
Barium	197	0.1
Beryllium	<0.5	0.5
Cadmium	1.4	1.0
Cobalt	6.6	1.0
Chromium	39.0	0.5
Copper	80.0	0.5
Mercury	<1.0	1.0
Molybdenum	<1.0	1.0
Nickel	20.6	1.0
Lead	274	3.0
Antimony	3.9	3.0
Selenium	3.1	3.0
Thallium	<1.0	1.0
Vanadium	25.0	0.5
Zinc	462	0.5

This detection limit is based on the dilution factor of 50.

Josie Quiambao Fox
Josie Quiambao
Chemist

January 30, 1991
Date

TTLC/CAM Metals, EPA Method 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA
SAMPLE ID: BLANK

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: 01/17/1991
DATE ANALYZED: 01/25/1991

	CONCENTRATION [mg/Kg (ppm)]	DETECTION LIMIT [mg/Kg (ppm)]
Silver	<0.5	0.5
Arsenic	<1.0	1.0
Barium	<0.1	0.1
Beryllium	<0.5	0.5
Cadmium	<1.0	1.0
Cobalt	<1.0	1.0
Chromium	<0.5	0.5
Copper	<0.5	0.5
Mercury	<1.0	1.0
Molybdenum	<1.0	1.0
Nickel	<1.0	1.0
Lead	<3.0	3.0
Antimony	<3.0	3.0
Selenium	<3.0	3.0
Thallium	<1.0	1.0
Vanadium	<0.5	0.5
Zinc	<0.5	0.5

This detection limit is based on the dilution factor of 50.

[signature] FOR:
Josie Quiambao
Chemist

January 30, 1991
Date

TTLC/CAM Metals, EPA Method 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA
SAMPLE ID: B1@2' MATRIX SPIKE RECOVERY

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: 01/17/1991
DATE ANALYZED: 01/25/1991

	SPIKE RECOVERY
Silver	86%
Arsenic	83%
Barium	103% *
Beryllium	87%
Cadmium	84%
Cobalt	80%
Chromium	86%
Copper	103% *
Mercury	84%
Molybdenum	85%
Nickel	101% *
Lead	104% *
Antimony	90%
Selenium	86%
Thallium	80%
Vanadium	99% *
Zinc	104% *

* Reagent spike set is used due to matrix interference.

FOR.
Josie Quiambao
Chemist

January 30, 1991
Date

TTLC/CAM Metals, EPA Method 6010

EUREKA LABORATORIES, INC.
6790 Florin-Perkins Road
Sacramento, CA 95828
(916) 381-7953

Order No: 91-01-116
Hazardous Waste Testing
Certification: E765

CLIENT: HARDING LAWSON ASSOCIATES
JOB #: 2222,055.04
LOCATION: 7TH & NATOMA
SAMPLE ID: B1@2' MATRIX SPIKE RECOVERY DUPLICATE

DATE RECEIVED: 01/15/1991
DATE EXTRACTED: 01/17/1991
DATE ANALYZED: 01/25/1991

	SPIKE RECOVERY
Silver	92%
Arsenic	91%
Barium	104% *
Beryllium	92%
Cadmium	90%
Cobalt	87%
Chromium	76%
Copper	103% *
Mercury	91%
Molybdenum	90%
Nickel	102% *
Lead	102% *
Antimony	95%
Selenium	95%
Thallium	82%
Vanadium	100% *
Zinc	104% *

* Reagent spike set is used due to matrix interference.

[signature] FOR: January 30, 1991
Josie Quiambao — Date
Chemist

Harding Lawson Associates
303 Second Street, Suite 630N
San Francisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

05-7
91-01-116

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222.055.04
Name/Location: 7TH & Natoma
Project Manager: Jim Ordons

Samplers: J Ordons
Recorder: Jas Ordns (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	PNA's (EPA 8100)	TPH (G/D)	CAM-17 METALS
48			X					X	B1	⊘2'		91	01	14		A4										X
									B1	⊘4.5'						A5							X	X		
									B1	⊘9'						A6							X	X	X	
									* B1	⊘9.5'												ON Hold				
									* B1	⊘14'												ON HOLD				
									B2	⊘1.5'						A7							X			
									B2	⊘10'						A8									X	
									* B2	⊘14'													ON HOLD			

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
J Ordons	Rich Mullins	1/15/91 9:47
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) B Edel	1/15/91 1410

METHOD OF SHIPMENT Concord Carrier

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HLA

303 Sec Street, Suite 830N
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(415) 777-9706 Telecopy

B-+
91-01-116

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222.055.04

Name/Location: 7TH & Natoma

Project Manager: Jim Ordons

Samplers: J Ordons

Recorder: J Ordons (Signature Required)

SOURCE CODE	MATRIX: Water	MATRIX: Sediment	MATRIX: Soil	MATRIX: Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	TPH(GAD)
42			X					1	B3	0	6'	91	01	14		A2							X	
									B3	0	10.5'					A3							X	X
									B3	0	14'					~~A4~~						ON		HOLD

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
J Ordons	Richard Millins	1/15/91 9:47
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) [illegible signature]	DATE/TIME 1/15/91 1410

METHOD OF SHIPMENT: Concord Carrier

Laboratory Copy White | Project Office Copy Yellow | Field or Office Copy Pink

Harding Lawson Associates
303 Second Street, Suite 630N
San Francisco, California 94107
(415) 543-8422
(415) 777-9706 Telecopy

B-4
91-01-116

CHAIN OF CUSTODY FORM

Lab: Eureka

Job Number: 2222,055.04
Name/Location: 7th & Natoma
Project Manager: J. Ordons

Samplers: T. Campbell
Recorder: [signature]
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
48			X		X					B-4	91	01	11	1030	A1

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	LEAD	TPH (G&D)
						X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
[signature]	J. Oelers	1/11/91 400
J. Oelers	Ed Millin	1/15/91 947

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		[signature] Eckel	1/15/91 1410

METHOD OF SHIPMENT: Concord Courier

DISTRIBUTION

6 copies:	San Francisco Redevelopment Agency 770 Golden Gate Avenue San Francisco, California 94102 Attention: Mr. William Nakamura Chief Engineer

AFC/JO/dk/A10216-R45

QUALITY CONTROL REVIEWER

Mark G. Filippini
Engineering Geologist

REGISTERED GEOLOGIST
MARK G. FILIPPINI
1312
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

APPENDIX C

CORRESPONDENCE WITH DTSC REGARDING PREVIOUS PEA REPORTS

STATE OF CALIFORNIA --- ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, Governor

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
REGION 2
700 HEINZ AVE., SUITE 200
BERKELEY, CA 94710-2737

June 19, 1992

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To JEFF LUDLOW	From L. MILLER
Co.	Co.
Dept.	Phone # 510-540-3803
Fax # 415-777-9706	Fax # 510-540-3819

Mr. Jeffrey F. Ludlow
Harding Lawson Associates
303 Second Street, Suite 630 North
San Francisco, California 94107

Dear Mr. Ludlow:

A quick review of the PEA which you submitted for the 1009 Mission Street site suggests that your approach to conducting the PEA is basically sound, however I am returning the PEA because I find the risk assessment unacceptable. Because the project proposes to locate housing above soil containing lead, arsenic, chromium(VI), thallium, and PNAs you must address the risk to on-site residents directly and quantitatively, not merely by saying that the site will be covered and therefore no risk to residents exists. The risk to on-site residents in the absence of any mitigation measures needs to be calculated.

The proposed mitigation measures need to be described with sufficient detail that estimates can be made of the potential for exposure to on-site residents with the mitigation measures in place. Although it is not explicitly stated, the report suggests that your proposed mitigation measures will eliminate any potential exposure of residents to soil. I cannot accept that your mitigation measures, which I might add you do not describe in any detail, will be 100% effective. The effectiveness of the proposed encapsulation of the site, including potential failure scenarios should be included when calculating the exposure to on-site residents with the mitigation measures in place.

Your statement of the "Apparent Problem" on page 8, section 2.4 is "Problems that may be encountered during and after construction of the proposed development are related to 1) health and safety issues associated with the disturbance of soil during construction, and 2) long term adverse health concerns that may affect future residents." Until a quantitative measure of this potential for long term adverse health risks is calculated there is no way to assess this risk. That is what I am asking you to do.

Sincerely,

Leonard Miller

Leonard Miller
Hazardous Materials Specialist
Site Mitigation Branch

cc: Don Cox, Judy Parker DTSC
Pam Hollis, San Francisco Dept. of Public Health

July 9, 1992

2222, 060.04

California Department of Toxic Substances Control
Region 2
700 Heinz Avenue, Suite 200
Berkeley, California 94710-2737

Attention: Mr. Leonard Miller

Gentlemen:

DTSC Comment Response
SFRA PEA Sites
San Francisco, California

This letter presents Harding Lawson Associates' (HLA) response to comments made in your letter of June 19, 1992 and in a June 26, 1992 meeting between HLA, the DTSC, the San Francisco Department of Public Health (SFDPH), and the San Francisco Redevelopment Agency (SFRA). You requested that our Preliminary Endangerment Assessment (PEA) reports for the SFRA sites include quantified risks to future residences of the site due to onsite soil exposure. Additionally, you requested a detailed discussion regarding the mitigative measures that will be implemented during post development soil handling activities to prevent residences from exposure. The purpose of this letter is to obtain your concurrence before submitting additional draft PEA reports on an approach to address your concerns .

HLA will present an exposure scenario whereby future onsite residents come into contact with soil. This scenario assumes that the affected soil is not encapsulated with a concrete floor slab. We assumed that exposure routes to residents in this scenario would comprise ingestion, dermal contact, and dust inhalation. This onsite scenario will demonstrate that the chemical concentrations for some chemicals exceed the health-based levels (HBLs; Tables 4-6 of 1009 Mission Street, June 5, 1992 version). The HBLs are intended to provide a conservative lower level estimate for soil concentrations associated with potential site exposures and resultant doses considered by the EPA to be without deleterious noncancer health effects, or to result in cancer risk estimates of less than a 10^{-6}(i.e., one-in-one-million) probability of an exposed individual developing cancer. These HBLs were used to develop a list of chemicals of concern (COCs). In the case of 1009 Mission Street, chemicals with concentrations which exceeded the HBLs were listed as COC. Using the National Contingency Plan (NCP.1990) point of departure of 1×10^{-6}, the revised reports for 1009 Mission and the remaining sites would conclude that without remediation and encapsulation of the site, the site COCs would present a potential health risk.

For a future onsite resident exposure scenario, HLA would assume that the site is totally encapsulated with a ground level structurally supported concrete slab and that a 0.1 inch width crack would develop around the perimeter of utility connections penetrating the approximately 1-foot thick concrete floor slab. Penetrating cracks at a utility line would be the type most likely to develop on a structurally supported

concrete floor slab engineered to withstand San Francisco earthquake hazards. Assuming that a 0.1-inch-wide crack would develop, for exposure to soil, HLA concludes that sufficient winds cannot be generated inside the building to blow dust particles from one foot below the slabs and up through the cracks. Ingestion, dermal contact, and inhalation exposure of dust would therefore not occur. To present quantified risks, HLA can estimate exposures to vapor emissions of the COCs, (none of which are known to be volatile) from onsite soil through the assumed total surface area of the cracks that would develop through the concrete slab. HLA can attempt to compare these exposures with background ambient air concentrations of these COCs in the South of Market Street area, although the likelihood of finding chemical data that represents that area is low.

In the subsequent PEA documents, HLA will discuss in more detail mitigative procedures that property managers will use to ensure that chemical exposure to residents from onsite soil are negligible. This plan will detail resident notification procedures, work areas, appropriate soil handling practices, and workers' health and safety plans. The discussion will also include deed restriction information written by the SFRA to ensure that the property is managed to protect residents' health and safety, and maintenance of cracks that may develop through the concrete floor.

We hope that our approaches address your concerns . We will proceed with these approaches in our subsequent documents unless you have comments or suggestions to the contrary. Please provide us with your comments by July 14, 1992.

Yours very truly,

HARDING LAWSON ASSOCIATES

Jeff F. Ludlow

Jeffrey F. Ludlow
Senior Geologist (MGF)

Mark Filippini

Mark G. Filippini
Engineering Geologist

JFL\dg\A14705-CT62

cc: San Francisco Department of Public Health
Attn: Ms. Pamela Hollis

San Francisco Redevelopment Agency
Attn: Mr. William Nakamura

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To BILL RUMPF	From LEN MILLER
Co.	Co.
Dept.	Phone # 540-3803
Fax # 415-749-2526	Fax # 540-3819

State of California

Memorandum

To : Bill Ryan
Deputy Director
Site Mitigation Branch
Department of Toxic Substances Control
P.O. Box 806
Sacramento, California 95812-0806

Date: September 24, 1992

From : Department of Toxic Substances Control
Region 2
Site Mitigation Branch
700 Heinz Avenue, Suite 200
Berkeley, California 94710

Subject: SAN FRANCISCO REDEVELOPMENT SITES: RESIDENTIAL HOUSING BUILT ABOV "CAPPED" HAZARDOUS WASTE

PURPOSE:

To consider the possibility of site specific approval for residential housing above a capped surface at sites with levels of contamination exceeding hazardous waste levels.

APPARENT PROBLEM:

The Site Evaluation Unit has been working with the San Francisco Redevelopment Agency on PEAs for several sites in the South of Market area in the city which have soils with contamination levels exceeding hazardous waste levels. The projects propose residential housing above a capped surface. We have been operating under the idea that such development would be acceptable if the project was protective of public health and the environment and that no absolute prohibition existed toward such development.

BACKGROUND:

The San Francisco Redevelopment Agency (SFRA) has proposed a site mitigation plan for a parcel in the south of Market (street) area. This project is part of the city's effort to replace housing for low income people who lost their shelter as a result of the 1989 earthquake. The immediate vicinity of the property is generally very low-income with residential hotels in a poor state of repair. The project will provide low and very low income families and individuals with housing at permanently affordable rents.

The financing of this project is dependent on State of California subsidies and federal low income tax subsidies. A

condition of applicability for the tax subsidies is the requirement to spend 10% of the development budget by the end of 1992. This is what creates the time crunch for SFRA. They feel that they need to get started on construction by mid to late October 1992.

CHEMICALS AND ASSOCIATED RISKS:

The levels of contamination at these sites are believed to be representative of the general area which contains fill from the early 1900s. The contaminants include lead, other heavy metals, PNAs, TPH and other substances. The 1009 Mission property also has arsenic and thallium but no volatile materials in the soil.

The baseline risk assessment at 1009 Mission shows the greatest potential risk (both carcinogenic and non-carcinogenic) from this site in the absence of mitigation measures to be from ingestion and/or dermal contact with soil.

RISK FROM MULTIPATHWAY COCs TO ONSITE RESIDENTS IN THE ABSENCE OF MITIGATION MEASURES

CARCINOGENIC RISK - 3×10^{-5} (average)
3×10^{-4} reasonable maximum exposure

NON-CARCINOGENIC - HAZARD INDEX 30-40

MITIGATION MEASURES:

The proposed mitigation measures are designed to prevent contact with the underlying soil. The first (ground floor) level will be used for parking with the apartments starting on the second story. The parking level will be a continuous concrete slab underlain by crushed rock and a geotextile layer above the soil containing the contaminants of concern.

In addition to these construction elements a management plan would be put in place which would inform workers of the existing hazards if they will contact the soil. A schedule for inspection of the integrity of this barrier and a commitment to repair and properly dispose of the soil which comes through the barrier has been agreed to. The managers of the site would be required to inform renters of the presence of the material below the structure and the hazards associated with contact with this soil. A deed restriction would be required in order to inform future owners of the site of the presence of these materials and would require notification of the Department if any change in use is planned.

According to SFRA there is much development underway and planned in this general area. The suggestion is made that the policy of allowing no residential construction in situations such as these could result in the Department preventing development in a large area of the City of San Francisco.

The reason that we led SFRA to believe that a project such as this could go forward was 1) the precedent of Site K where the Department allowed a similar project to go forward and 2) the understanding that a deed restriction could be tailored to a specific site rather than having required elements ie. a clause preventing the site from being used for a hospital, school, etc.

SUMMARY:

We feel that the greatest problem that this project raises is the issue of what will we not allow beneath residential housing ie. where do we draw the line? The proposed project may be controversial, but we feel that it is protective of public health because it minimizes exposure to contaminated soil. For the above reasons, your decision on this issue will be most appreciated.

Leonard Miller for
Donald L. Cox, Esq., Chief
Site Evaluation Unit
Site Mitigation Branch

Attachment

cc: Barbara J. Cook, Chief
Department of Toxic Substances Control
Region 2 - Site Mitigation Branch
700 Heinz Avenue, Suite 200
Berkeley, California 94710

Bill Rempf
San Francisco Redevelopment Agency
770 Golden Gate Avenue
San Francisco, California 94102

State of California Department of Toxic Substances Control

Memorandum

To : Len Miller
Region 2, Site Mitigation Division
700 Heinz Avenue, Building F
Second Floor
Berkeley, California 94710

Date: 1 October 1992

From : Office of the Science Advisor
400 P Street, Fourth Floor
P. O. Box 806
Sacramento, California 95812-0806
(916) 255-2038

Subject: San Francisco Redevelopment Agency
PCA 11020 Site Code 200322-00

Background

Previously, we reviewed the risk assessment portion of a Preliminary Endangerment Assessment (PEA) prepared by Harding Lawson Associates (HLA), contractors for the San Francisco Redevelopment Authority. In a memorandum to the Region dated 27 July 1992, we requested certain changes and clarifications to this risk assessment.

Document Reviewed

We reviewed the risk assessment portion of "Site Assessment, 1009 Mission Street, San Francisco, California", prepared by HLA for the San Francisco Redevelopment Authority and dated 18 August 1992. The principal focus of this review was conformance with DTSC requests as stated in the memorandum of 27 July 1992.

Comments

1. Since we have not reviewed the site characterization data, our review assumes that these data are accurate and complete, that acceptable sampling and analytical procedures were used, and that Regional staff have determined that the data reported accurately reflect the magnitude and extent of contamination at the site.

2. Deficiencies noted in the 27 July 1992 memorandum have been adequately addressed. A baseline risk assessment is presented. Appropriate health based levels were derived or employed for all chemicals of concern. It is acceptable to assume that an on-site construction worker could be exposed for 250 days. The assumption of a 90% reduction in exposure point concentrations is acceptable for the future residential scenario.

Conclusions

The baseline risk assessment presented is adequate for the purposes of the PEA. This assessment is appropriate for use as a template for other, similar properties.

If we can be of any further assistance, please call us.

John P. Christopher

John P. Christopher, Ph.D., D.A.B.T.
Staff Toxicologist
Human and Ecological Risk Section

JE Parker

Reviewed by: Judith Parker, Ph.D., D.A.B.T.
Lead Staff Toxicologist
Human and Ecological Risk Section

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To JEFF LUDLOW	From LEN MILLER
Co.	Co.
Dept.	Phone # 510-540-3803
Fax # 415-777-9706	Fax # 510-540-3819

Memorandum

To : Len Miller
Region 2, Site Mitigation Division
700 Heinz Avenue, Building F
Second Floor
Berkeley, California 94710

Date: 9 November 1992

From : Office of the Science Advisor (OSA)
400 P Street, 4th Floor
P. O. Box 806
Sacramento, CA 95612-0806
(916) 255-2038

Subject : San Francisco Redevelopment Agency
PCA Code 11020 Site Code 200322-00

Background

Previously, we reviewed the risk assessment portion of a Preliminary Endangerment Assessment (PEA) prepared by Harding Lawson Associates (HLA), contractors for the San Francisco Redevelopment Authority, for a site at 1009 Mission Street, San Francisco. In a memo dated 1 October 1992 we approved the methods used by HLA in the risk assessment of that property.

Document Reviewed

We reviewed the document entitled, "Site Assessment, 1028 Howard Street, San Francisco, California, Volumes I and II". This document was prepared by HLA for the San Francisco Redevelopment Authority and dated 28 August 1992. The principal focus of this review was the risk assessment portion of the document.

General Comments

1. Since we have not reviewed the site characterization data, our review assumes that these data are accurate and complete, that acceptable sampling and analytical procedures were used, and that Regional staff have determined that the data reported accurately reflect the magnitude and extent of contamination at the site.

2. The document was reviewed for scientific content. Minor grammatical and typographical errors that do not affect the interpretation have not been noted. These should, however, be corrected in the final version of the document.

3. As this document is revised and resubmitted to DTSC, every change that is made should be clearly identified. This may be done in several ways: by submitting revised pages with the reasons for the changes noted, by the use of strikeout and underline, by the use of shading and italics, or by cover letter stating how each DTSC comment has been addressed. Any change in the document that have not been made in response to specific DTSC comments should be identified and the reason for the change specified.

4. In the memo dated 1 October 1992, the Office of Science Advisor gave approval to the general approach used in the risk assessment for the property at 1009 Mission Street. After careful review of the current document, which used the same approach, we have some suggested changes in the methods to be used for similar properties in the future. These are detailed below. See especially comments 7, 9, and 16 below.

5. The risk assessment contains excessive use of initializations and acronyms. Such overuse appears throughout the document, but it is nowhere more evident than in the section on "health-based levels" beginning on page 23 (RCRAc PS, tHBL, etc.). Use words.

Specific Comments

1. Page 3, fifth bullet: Exposures are stated to be "below target risk criteria" but exposures to lead are "slightly above acceptable criteria". Resolve these conflicting statements.

2. Sec. 3.2, Soil Sampling, pp. 16-17 and Table 3-1: It is stated that four borings were drilled and sampled. If soils from boring B-4 were analyzed, these data are not presented. Are the soils around B-4 not to be disturbed? It should be clearly stated in this section just one sample was analyzed for metals and that any conclusions about metals are therefore highly uncertain. Although it seems that lead is the most important driver for health risk at the site, thallium levels are also quite high.

   Polynuclear aromatic hydrocarbons (PNAs) were the only specific class of organic chemicals sought at the site. Table 3-1 suggests that analyses were conducted for carcinogenic PNAs. Tables 3-1, 3-2, and 4-1 show that the specific suite of PNAs sought did not include all carcinogenic PNAs but it did include several non-carcinogenic PNAs. Clarify the language in text and tables.

   The possible presence of other organic chemicals, especially volatiles, could have been of importance, given that the site is to be capped. If any evidence exists to indicate that volatiles are absent from this site, this evidence should be presented.

3. Total Oil and Grease, p. 18: The statement that total oil and grease were incorporated in the with soil along with the PNAs is completely unsupported. It should be removed.

4. Metals, p. 19: Exceeding the Total Threshold Limit Concentration (TTLC) is not a valid basis for removing a metal as a substance of possible concern. This should be done only by comparison with background or with a health-based level.

5. Data Quality, p. 19-20: If the values in Table 3-2 are correct, then total carcinogenic PNAs exceed 10 ppm in soil from boring B-1 at 8.5 ft. See comment 3 above. Discussion of adequate characterization does not include the elevated concentration of thallium which was detected.

6. Chemical Analyses, p. 22: Frequency of detection may not be used to eliminate a detected

chemical as a potential chemical of concern at sites such as this one where so few samples were taken.

7. Analytical Data, Tables 3-2, 4-1, and 4-2: These two tables are in complete disagreement. This is the greatest potential flaw in the risk assessment. Indeno(1,2,3-cd)pyrene is considered a carcinogenic PNA. It is shown as having been detected in Table 3-2, but it does not appear in Table 4-1. If this chemical was actually present at the site, then all the carcinogenic risks have been underestimated and dozens of textual changes are needed.

   The presentation of "ND" in Table 3-2 does not allow for the verification of mean concentrations calculated using one-half the detection limits. Show non-detects as "<XX" or "XX u", where XX is the numerical limit of quantitation for that analyte and sample.

   The background values shown in Table 4-2 are very high for all metals shown. We were unable to find these numbers in Trace Metals in the Terrestrial Environment by D. C. Adriano (1986). These background values are not acceptable for California soils without further documentation.

8. Exposure Point Concentrations, pp. 30-31: Eliminate the statement near the bottom of page 30 about overestimation due to lack of degradation. Metals will not degrade in soils. PNAs have apparently been present for decades, perhaps nearly a century. In this assessment the highest detected values differed little from the 95% upper confidence limits on the means. In future assessments with such small sample sizes, use the higher of these two values for calculating exposure concentrations. If any uncertainty exists about how to proceed for a particular site, consult Dr. John Christopher of DTSC (916-255-2038).

9. Fugitive Dust, p. 31, Appendices F & G: We were not able to follow the calculations for determining concentrations of dust in air. On page 31 we find 0.07 mg/m^3 as a figure for respirable dust, which was used to calculate the values in Table 4-9. On page E-8 we find 0.715 mg/m^3, which seems to conflict with the value 0.513 mg/m^3 shown in Table E-2 and bear no relation to the earlier figure of 0.07 mg/m^3. We do not understand the text on page E-10 explaining the origin of the figure 0.276 mg/m^3 used in Table E-3. We cannot track any number in Appendix F to any number in Appendix E. The Fugitive Dust Model used in Appendix F calculates concentrations of dust which fall out onto soil, but the figure of merit is the concentration of dust in air which receptors breathe. The entire treatment of fugitive dust is confusing. Because Tables 4-24 through 4-26 indicate that dust contributes 20% or more of the total risk at the site, this subject must be presented more clearly.

10. Page 32: Are references to Tables 9-24 through 9-26 meant to be Tables 4-24 through 4-26?

11. Risk Characterization, pp. 31-37: For each scenario, name the major contributor(s) to carcinogenic and non-carcinogenic risks. The wrong values for estimates of cancer risk from Table 4-26 are shown on page 37 for Child/Adult Resident and Adult Resident. Estimates of cancer risk should change if indeno(1,2,3-cd)pyrene was actually detected at the site.

12. <u>Page 40, 2nd paragraph</u>: Conservatism, not conservation.

13. <u>Uncertainty, p. 42-43</u>: Small sample sizes in analytical data lead to uncertainties in various parts of the risk assessment. These are not eliminated with an assumption that the site is adequately characterized. Assuming that "all individuals within a particular receptor group will receive the same dose" almost certainly introduces less uncertainty less than the use of myriad and unprovable default assumptions.

14. <u>Summary, p. 46</u>: Direct measures of environmental concentrations could reduce uncertainty about attendant exposures and risks <u>if the sample population is large</u>. This was not the case at this site.

15. <u>Section 6.2, p. 49</u>: Why is a vapor barrier required? Given the results of the risk characterization, it would seem that recommendations regarding landscaping should be stated more strongly.

16. <u>Appendix H</u>: This material is laid out extremely well. On page H-2 your values yield a daily ventilation of 15 m^3/day for adult residents, while on pages H-9 your default value of 1.4 m^3/hr for a worker yields 11.4 m^3/day over an 8 hr day. Bring your estimates into conformance with DTSC's recommended ventilation rates of 20 m^3/day both for adults in a residential scenario and for workers over an 8 hr day in a commercial or industrial scenario.

Conclusions

The risk assessment presented as part of the site assessment of 1028 Howard Street, San Francisco, is acceptable, subject to adequate responses to the comments delineated above. Future risk assessments on similar properties should also conform to these comments.

If you have any questions, please call me.

John P. Christopher

John P. Christopher, Ph.D., D.A.B.T.
Staff Toxicologist
Human and Ecological Risk Section (HERS)

J. Parker

Reviewed by: Judith A. Parker, Ph.D., D.A.B.T.
Lead Staff Toxicologist, HERS

cc: Dr. M. J. Wade

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, Governor

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
REGION 2
700 HEINZ AVE., SUITE 200
BERKELEY, CA 94710 2737

November 12, 1992

Mr. William Rumpf
Chief, Housing Production and Management
San Francisco Redevelopment Agency
770 Golden Gate Avenue
San Francisco, California 94102

Dear Mr. Rumpf,

1028 HOWARD PROPOSED APARTMENT PROJECT

The Department of Toxic Substances Control (Department) has reviewed your Preliminary Endangerment Assessment (PEA) and the associated risk assessment for 1028 Howard Street (HLA Job No. 2222,060.04) dated August 18, 1992 and found the PEA to be complete and the proposed Hazardous Waste Management Plan to be acceptable with the additional conditions listed below.

1) FINAL CONSTRUCTION PLANS

The Department shall have copies of the final construction drawings and architectural plans which document the nature of the barrier to exposure to on-site soil and the location of the living units with respect to this barrier. The Department of Toxic Substances Control (Department) shall reserve the right to inspect and document the construction.

2) MANAGEMENT OF CONCRETE BARRIER

A plan shall be developed and submitted for review by the owner/operator to insure the integrity of the encapsulating concrete slab. This plan should include an 1) inspection schedule, 2) designation of a responsible individual, 3) notification of the Department if there is a break in the barrier, and 4) a contingency plan to handle any soil which becomes exposed.

3) HEALTH AND SAFETY PLAN

A workers health and safety plan (H&S Plan) shall be prepared and implemented according to Title 29, Code of Federal Regulations, Part 1910, Section 120 and Title 8, Section 5192. The H&S Plan needs to be approved by the Department.

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To PHILIP WILLIAMS	From L. MILLER
Co. SFRA	Co.
Dept.	Phone #

4) DUST CONTROL AND AIR MONITORING

The health and safety officer shall be qualified to monitor the levels of dust generated during the construction. An air monitoring plan shall be in place to protect workers and people in the surrounding area from exposure to contaminated soil.

5) GROUNDWATER MONITORING

A groundwater monitoring plan shall be developed which shall measure the impact on groundwater from contaminants at the site. The groundwater samples shall be tested for lead, PNAs, arsenic, copper, zinc, thallium, chromium VI and TPH.

6) LANDSCAPING

All landscaping must be placed above the concrete barrier.

7) DEED RESTRICTION

A covenant for land use shall be submitted to the Department for approval by December 30, 1992. A copy of the deed with hazardous waste notation shall then be submitted to the Department. As a part of this covenant all potential and actual renters shall be notified of the presence of hazardous waste beneath the site and the potential hazards associated with contact with this soil.

If you have any questions, please call Leonard Miller at (510) 540-3803.

Sincerely,

Barbara J Cook

Barbara J. Cook, P.E., Chief
Site Mitigation Branch

cc: Mr. William Lee, Director
Toxics Health and Safety Services
Department of Public Health
City and County of San Francisco
101 Grove Street
San Francisco, California 94102

San Francisco Bay RWQCB
2101 Webster Street, #500
Oakland, California 94612

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
REGION 2
700 HEINZ AVE., SUITE 200
BERKELEY, CA 94710-2737

December 22, 1992

Mr. Jeffrey F. Ludlow
Harding Lawson Associates
303 Second Street, Suite 630N
San Francisco, California 94107

SUBJECT: PEA for 241 Sixth Street

Dear Jeff:

Attached are the comments of John Christopher who did the toxicology review for this site, please respond to his comments in finalizing the PEA. I would like to support his comments that the document has the appearance of not being reviewed before being issued. As an example the HLA Job Number is the same as appears on the PEA for 1009 Mission. There are several references in the body of the report to 1009 Mission which seem inappropriate. Please do a complete review of this document to correct the errors and omissions present.

Please let me know when you would like to meet together with the San Francisco Health Department to discuss how we might work together more effectively on future projects. As you know my particular concern is obtaining data which will positively determine the presence or absence of volatiles at future sites. This data would be most effectively gathered along with the other analytical data you obtain. It would be best if we could agree on a method to make this determination prior to doing any field work at any other sites.

Please call if you have any questions or need any clarification.

Sincerely,

Leonard Miller

Leonard Miller

cc: (cover only)
Bill Lee, San Francisco Department of Public Health
Bill Rumpf, San Francisco Redevelopment Agency

State of California | Department of Toxic Substances Control

Memorandum

To: Len Miller
Region 2, Site Mitigation Division
700 Heinz Avenue, Building F
Second Floor
Berkeley, California 94710

Date: 10 December 1992

From: Office of the Science Advisor (OSA)
400 P Street, 4th Floor
P. O. Box 806
Sacramento, CA 95612-0806
Voice: (916) 255-2038 Fax: (916) 255-2096

Subject: San Francisco Redevelopment Agency: 241 6th Street
PCA Code 11020 Site Code 200322-00

Background

Previously, we have reviewed the risk assessment portions of two Preliminary Endangerment Assessments (PEA) prepared by Harding Lawson Associates (HLA), contractors for the San Francisco Redevelopment Authority. Both properties were in the downtown area of San Francisco.

Document Reviewed

We reviewed the document entitled, "Site Assessment, 241 Sixth Street, San Francisco, California, Volumes I and II". This document was prepared by HLA for the San Francisco Redevelopment Authority and dated 17 November 1992. The principal focus of this review was the risk assessment portion of the document.

General Comments

1. Since we have not reviewed the site characterization data, our review assumes that these data are accurate and complete, that acceptable sampling and analytical procedures were used, and that Regional staff have determined that the data reported accurately reflect the magnitude and extent of contamination at the site.

2. The document was reviewed for scientific content. Minor grammatical and typographical errors that do not affect the interpretation have not been noted. These should, however, be corrected in the final version of the document.

   We noted dozens of grammatical errors, many more than seen in previous documents in this series. We also found calculations which did not track to their sources. <u>We take this as an indication that this document did not undergo adequate quality assurance and/or peer review.</u>

3. As this document is revised and resubmitted to DTSC, every change that is made should be

clearly identified. This may be done in several ways: by submitting revised pages with the reasons for the changes noted, by the use of strikeout and underline, by the use of shading and italics, or by cover letter stating how each DTSC comment has been addressed. Any change in the document that have not been made in response to specific DTSC comments should be identified and the reason for the change specified.

4. The risk assessment contains excessive use of initializations and acronyms. Such overuse appears throughout the document, but it is nowhere more evident than in the section on "health-based levels" beginning on page 23 (RCRAc PS, tHBL, etc.). Use words.

Specific Comments

1. Data Quality, Sec. 3.4, p. 15-16 and Table 1: Circular reasoning is used regarding the adequacy of the site investigation. It is stated that lead and polynuclear aromatic hydrocarbons (PNA) are likely to be present at the site. These are sampled for and found. No other organic chemicals are sought. The circle is made complete with the assumption that these analyses adequately characterize the site.

   The possible presence of other organic chemicals, especially volatiles, could have been of importance, given that the site is to be capped. If any evidence exists to indicate that volatiles are absent from this site, this evidence should be presented.

2. Chemical Analyses, Sec. 4.1.1, p. 18 and elsewhere: The site is twice referred to here as 1009 Mission street. This error is repeated periodically throughout the report and all the Appendices.

3. Background, Sec. 4.1.2, p. 19: The background values shown in Table 4-2 are very high for all metals shown. We were unable to find these numbers in Trace Metals in the Terrestrial Environment by D. C. Adriano (1986). These background values are not acceptable for California soils without further documentation.

4. Chemicals of Concern: Eliminating detected chemicals by comparison to health-based levels is not a valid method of selecting chemicals of concern. Possible health effects of the chemicals eliminated are additive to the effects of the chemicals remaining after the screening procedure. Therefore, risks are underestimated by considering only the latter class of chemicals. The method is acceptable for 241 Sixth Street, because lead and polynuclear aromatic hydrocarbons would drive the risk assessment regardless. At other sites we will not accept the use of risk characterization procedures to eliminate chemicals of concern.

5. Lead, Sec. 4.4.1, p. 29 ff.: No discussion is presented for lead in the pre-construction scenario. We estimate that the hazard ratio for children could be as high as 30 (6,000 ppm vs. 200 ppm). In addition, mention of lead is missing from the conclusions on page 35.

6. Uncertainty, p. 40: Low-dose extrapolations and species-to-species extrapolations introduce uncertainties orders of magnitude greater than the other items mentioned in the bullets on

page 40. Emphasize the <u>principal</u> sources of uncertainty and their effect on the conclusions. Also, it seems appropriate to address here the uncertainties surrounding the estimated hazard index of 2 for thallium in the post-construction scenario. This is the only value from the risk characterization in the post-construction scenario which raises a question.

7. Table 2: Present the sample quantitation limits instead of "ND" so calculations of average concentrations can be verified.

8. Table 4.4: The ventilation rate for an adult in a residential scenario should be 20 m^3/day.

9. Table 4.5a: The oral slope factor shown for Cr^{+6} is "NA", while that in Table 4.5b is 0.42. Make the two tables consistent.

10. Table 4.6: Using default values and equations from Tables 4-3 and 4-4 and toxicity values from Table 5b, we were unable to reproduce many of the values shown in Table 4.6. In particular, total Health Based Levels for carcinogens for children could not be reproduced. The values in this table require another round of quality assurance. Also, values are shown for lead and nickel based on carcinogenicity via the oral route, but DTSC does not consider these metals to be carcinogenic by this route.

11. Table 4-9: The mean values for chemicals of concern cannot be verified because sample quantitation limits are not shown in Table 3-2.

Conclusions

The risk assessment presented as part of the site assessment of 241 Sixth Street, San Francisco, is adequately conceived, but its acceptability cannot be determined, because too many errors were detected. We recommend that the contractor proceed to writing the final document with two caveats. First, the comments above must be addressed; and second, the risk assessment should be subjected to technical editing and quality assurance procedures to remove the many errors.

If you have any questions, please call me.

John P Christopher

John P. Christopher, Ph.D., D.A.B.T.
Staff Toxicologist
Human and Ecological Risk Section (HERS)

JAParker

Reviewed by: Judith A. Parker, Ph.D., D.A.B.T.
Lead Staff Toxicologist, HERS

cc: Dr. M. J. Wade

March 12, 1993

10252-060

California Department of Toxic Substances Control
Region II Site Mitigation Branch
700 Heinz Avenue, Suite 200
Berkeley, California 94710

Attention: Mr. Leonard Miller

Gentlemen:

Response to DTSC Comments
San Francisco Redevelopment Agency Sites
1009 Mission Street,
1028 Howard Street,
241 Sixth Street
San Francisco, California

Enclosed please find Harding Lawson Associates' (HLA's) response to California Department of Toxic Substances Control (DTSC) comments presented in their October 1, 1992, memorandum for the 1009 Mission Street site; in their November 9, 1992, memorandum regarding the 1028 Howard Street site; and in their December 10, 1992, memorandum regarding the 241 Sixth Street site. Where response to DTSC comments requires changes in the draft text, HLA has included pages of those reports where the changes have been made. Changes to the text are indicated by strikeout and underlines. For response to DTSC comments where changes were not required in the text, HLA has attached a comment response sheet for each report.

Once you have reviewed our responses to DTSC comments, please contact us and we will finalize the documents.

Yours very truly,

HARDING LAWSON ASSOCIATES

S Ardalan

Semiramis Ardalan
Senior Environmental Scientist

Jeffrey F. Ludlow
Senior Geologist

SA/JFL/dm/B16737-CT108

Enclosures

cc: San Francisco Redevelopment Agency
Attention: Mr. Bill Nakamura

RESPONSE TO COMMENTS
SAN FRANCISCO REDEVELOPMENT AGENCY: 1009 MISSION STREET

The California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) provided the comments reprinted herein (bold text) on the *Site Assessment, 1009 Mission Street; Site Assessment, 1028 Howard Street*; and *Site Assessment, 241 Sixth Street* dated October 1, 1992; November 9, 1992; and December 10, 1992; respectively. Harding Lawson Associates (HLA) prepared responses for the San Francisco Redevelopment Agency (SFRA) following each comment.

A. General Comment

We reviewed the risk assessment portion of "Site Assessment, 1009 Mission Street, San Francisco, California", prepared by HLA for the San Francisco Redevelopment Authority and dated 18 August 1992. The principal focus of this review was conformance with DTSC requests as stated in the memorandum of 27 July 1992.

Specific Comments

Comment 1: **Since we have not reviewed the site characterization data, our review assumes that these data are accurate and complete, that acceptable sampling and analytical procedures were used, and that Regional staff have determined that the data reported accurately reflect the magnitude and extent of contamination at the site.**

Response: HLA acknowledges this comment.

Comment 2: **Deficiencies noted in the 27 July 1992 memorandum have been adequately addressed. A baseline risk assessment is presented. Appropriate health based levels were derived or employed for all chemicals of concern. It is acceptable to assume that an on-site construction worker could be exposed for 250 days. The assumption of a 90% reduction in exposure point concentrations is acceptable for the future residential scenario.**

Response: HLA acknowledges this comment.

RESPONSE TO COMMENTS
SAN FRANCISCO REDEVELOPMENT AGENCY: 1028 HOWARD STREET

A. General Comments

Comment 1: Since we have not reviewed the site characterization data, our review assumes that these data are accurate and complete, that acceptable sampling and analytical procedures were used, and that Regional staff have determined that the data reported accurately reflect the magnitude and extent of contamination at the site.

Response: HLA acknowledges this comment.

Comment 2: The document was reviewed for scientific content. Minor grammatical and typographical errors that do not affect the interpretation have not been noted. These should, however, be corrected in the final version of the document.

Response: The minor grammatical and typographical errors have been corrected. Additional quality assurance and peer review was performed and revisions are noted in the attachments using strikeouts and underlining (redlining).

Comment 3: As this document is revised and resubmitted to DTSC, every change that is made should be clearly identified. This may be done in several ways: by submitting revised pages with the reasons for the changes noted, by the use of strikeout and underline, by the use of shading and italics, or by cover letter stating how each DTSC comment has been addressed. Any change in the document that have not been made in response to specific DTSC comments should be identified and the reason for the change specified.

Response: The pages revised by use of redlining are attached for agency approval prior to issuing a final document. Tables with major content changes are also attached; the changes have not been redlined. Revisions in the footnotes to Tables 4-27 through 4-44 have been made to reflect the correct section numbers, but they are not included in the attachments.

Comment 4: In the memo dated 1 October 1992, the Office of Science Advisor gave approval to the general approach used in the risk assessment for the property at 1009 Mission Street. After careful review of the current document, which used the same approach, we have some suggested

changes in the methods to be used for similar properties in the future. These are detailed below. See especially comments 7, 9, and 16 below.

Response: HLA will consider the comments on 1009 Mission Street, 241 Sixth Street, and 1028 Howard Street prior to performing risk assessments for similar properties.

Comment 5: The risk assessment contains excessive use of initializations and acronyms. Such overuse appears throughout the document, but it is nowhere more evident than in the section on "health-based levels" beginning on page 23 (RCRAc PS, tHBL, etc.). Use words.

Response: Use of initializations and acronyms has been decreased wherever practical in the existing document. Further decreases will be considered in future documents at similar properties.

B. Specific Comments

Comment 1: Page 3, fifth bullet: Exposures are stated to be "below target risk criteria" but exposures to lead are "slightly above acceptable criteria". Resolve these conflicting statements.

Response: The text has been revised as shown in the attachments.

Comment 2: Sec. 3.2, Soil Sampling, pp. 16-17 and Table 3-1: It is stated that four borings were drilled and sampled. If soils from boring B-4 were analyzed, these data are not presented. Are the soils around B-4 not to be disturbed? It should be clearly stated in this section just one sample was analyzed for metals and that any conclusions about metals are therefore highly uncertain. Although it seems that lead is the most important driver for health risk at the site, thallium levels are also quite high.

Polynuclear aromatic hydrocarbons (PNAs) were the only specific class of organic chemicals sought at the site. Table 3-1 suggests that analyses were conducted for carcinogenic PNAs. Tables 3-1, 3-2, and 4-1 show that the specific suite of PNAs sought did not include all carcinogenic PNAs but it did include several non-carcinogenic PNAs. Clarify the language in text and tables.

The possible presence of other organic chemicals, especially volatiles, could have been of importance, given that the site is to be capped. If any evidence exists to indicate that volatiles are absent from this site, this evidence should be presented.

Response: A report addendum was provided to DTSC on November 10, 1992, which included corrected versions of Tables 3-1 and 3-2. That addendum addressed the issues raised in the first two paragraphs of this comment; the text and tables were not changed further. The correct Tables 3-1 and 3-2 are attached here as well, and will be in the final report. Based on comment 7, the detection limits have been added to Table 3-2. The concentration values used in the original risk assessment and tables (Section 4.0 and Tables 4-1 through 4-44, respectively) used the correct information.

The soil sample analytical parameters were developed based on the site history presented in Baseline Environmental Consulting's report. Their report suggests that on-site sources of soil and groundwater contamination did not exist; chemical analyses were therefore restricted to compounds detected in fill placed at the site in the late 19th century and analyzed previously at nearby sites.

Comment 3: Total Oil and Grease, p. 18: The statement that total oil and grease were incorporated in with the soil along with the PNAs is completely unsupported. It should be removed.

Response: On the basis of HLA's experience in characterizing sites underlain by coal gasification plant waste, such as this site, PNA compounds generally exist with heavy petroleum hydrocarbons. The total oil and grease analytical results may represent those heavier petroleum hydrocarbon compounds. In order not to confuse the reader, the statement has been deleted from the text as shown in the attachment.

Comment 4: Metals, p. 19: Exceeding the Total Threshold Limit Concentration (TTLC) is not a valid basis for removing a metal as a substance of possible concern. This should be done only by comparison with background or with a health-based level.

Response: The text does not indicate that any metals were excluded based on comparison to TTLCs. As shown in Section 4.1, chemical concentration data were compared to background, health-based regulatory or non-regulatory values for identification of COCs. In Section 3.3, the reported soil concentrations were compared to TTLCs for the purpose of evaluating whether the soil might be considered a state hazardous waste.

Comment 5: Data Quality, p. 19-20: If the values in Table 3-2 are correct, then total carcinogenic PNAs exceed 10 ppm in soil from boring B-1 at 8.5 ft. See comment 3 above. Discussion of adequate characterization does not include the elevated concentration of thallium which was detected.

Response: Based on the corrected Table 3-2 (attached), which was previously submitted to DTSC, the text does not need to be revised. Thallium was selected as a COC. Possible health risks were characterized in Section 4.0, and thallium did not need to be discussed separately in Section 3.3.

Comment 6: Chemical Analyses, p. 22: Frequency of detection may not be used to eliminate a detected chemical as a potential chemical of concern at sites such as this one where so few samples were taken.

Response: Antimony, beryllium, cadmium, mercury, molybdenum, selenium, and silver were excluded based on a frequency of detection of zero percent in the one sample analyzed. However, inclusion of these chemical results would not change the actions proposed at this site. Small sample sizes will be considered in future site investigations.

Comment 7: Analytical Data, Tables 3-2, 4-1, and 4-2: These two tables are in complete disagreement. This is the greatest potential flaw in the risk assessment. Indeno(1,2,3-cd)pyrene is considered a carcinogenic PNA. It is shown as having been detected in Table 3-2, but it does not appear in Table 4-1. If this chemical was actually present at the site, then all the carcinogenic risks have been underestimated and dozens of textual changes are needed.

The presentation of "ND" in Table 3-2 does not allow for the verification of mean concentrations calculated using one-half the detection limits. Show non-detects as "<XX" or "XX u", where XX is the numerical limit of quantitation for that analyte and sample.

The background values shown in Table 4-2 are very high for all metals shown. We were unable to find these numbers in Trace Metals in the Terrestrial Environment by D.C. Adriano (1986). These background values are not acceptable for California soils without further documentation.

Response: As indicated in comment 2, a corrected Table 3-2 was submitted to DTSC and is attached; please not that indeno(1,2,3-cd)pyrene was not detected at the site. Table 3-2 has been subsequently changed to show the reported detection limit for each compound. The concentration values used in the original risk assessment tables (Tables 4-1 through 4-44) used the correct information.

As indicated in the revised text to Section 4.1.2.1, the background values shown in Table 4-2 were for general information purposes only; therefore, the values were not closely scrutinized. The Frieberg et al. (*1986*) reference used at a similar property under review by DTSC was used for consistency purposes. Footnotes have been added to clarify the references used to compile the background data.

Comment 8: Exposure Point Concentrations, pp. 30-31: Eliminate the statement near the bottom of page 30 about overestimation due to lack of degradation. Metals will not degrade in soils. PNAs have apparently been present for decades, perhaps nearly a century. In this assessment the highest detected values differed little from the 95% upper confidence limits on the means. In future assessments with such small sample sizes, use the higher of these two values for calculating exposure concentrations. If any uncertainty exists about how to proceed for a particular site, consult Dr. John Christopher of DTSC (916-255-2038).

Response: The statement has not been eliminated but has been revised, as shown in the attachment, to clarify that degradation was not mentioned as a process specific to all the COCs, especially metals. The lesser of the 95-percent upper confidence limit (UCL) and maximum were used in evaluating reasonable maximum exposure scenarios, in accordance with risk assessment guidelines. Future assessments will consider sample sizes prior to using this as a guideline. Using the maximum instead of the 95-percent UCL is not expected to change the conclusions of the report.

Comment 9: Fugitive Dust, p. 31, Appendices F & G: We were not able to follow the calculations for determining concentrations of dust in air. On page 31 we find 0.07 mg/m^3 as a figure for respirable dust, which was used to calculate the values in Table 4-9. On page E-8 we find 0.715 mg/m^3, which seems to conflict with the value of 0.513 mg/m^3 shown in Table E-2 and bear no relation to the earlier figure of 0.07 mg/m^3. We do not understand the text on page E-10 explaining the origin of the figure 0.276 mg/m^3 used in Table E-3. We cannot track any number in Appendix F to any number in Appendix E. The Fugitive Dust Model used in Appendix F calculates concentrations of dust which fall out onto soil, but the figure of merit is the concentration of dust in air which receptors breathe. The entire treatment of fugitive dust is confusing. Because Tables 4-24 through 4-26 indicate that dust contributes 20% or more of the total risk at the site, this subject must be presented more clearly.

Response: Appendices E, F, and G pertain to the during construction scenarios and other than the value on page E-8 (see attached) the information is correct and did not require revisions. The following should clarify the purpose of each of the sections or tables referred to in the comment. In addition, the results of the risk assessment do not require any revisions based on this comment. Revisions to Appendices E and F will be considered in future reports to clarify the approaches and results used in risk assessment.

- Appendices E, F, and G do not support the dust air concentrations of 0.07 mg/m^3 which was assumed for pre-construction scenarios (see Section 4.3) not for during construction scenarios.

- Table 4-9, which is the basis for risk characterization for the pre-construction scenarios, did not need to be revised based on this comment.

- The input values, calculations, and output values (findings) presented in Appendices E and F are correct.

- The results in Table E-3 are for evaluation of the offsite receptors for the during construction inhalation exposure scenario (see page E-10) while the results in Tables F1 and F2 are for evaluation of offsite receptors for the during construction ingestion of fruits and vegetables and ingestion/dermal contact exposure scenarios (see page F2).

Comment 10: **Page 32: Are references to Tables 9-24 through 9-26 meant to be Tables 4-24 through 4-26?**

Response: Yes. The revised text is attached.

Comment 11: **Risk Characterization, pp. 31-37: For each scenario, name the major contributor(s) to carcinogenic and non-carcinogenic risks. The wrong values for estimates of cancer risk from Table 4-26 are shown on page 37 for Child/Adult Resident and Adult Resident. Estimates of cancer risk should change if indeno(1,2,3-cd)pyrene was actually detected at the site.**

Response: The contributing COCs are summarized in the conclusions (Section 4.6). The existing text was not revised. Section 4.4.2.3 has been revised to reflect the correct values from Table 4-26. The conclusions of the report are not affected. Indeno(1,2,3-cd)pyrene was not detected at the site as shown in the correct version of Table 3-2.

Comment 12: **Page 40, 2nd paragraph: Conservatism, not conservation.**

Response: The correction is shown in the attachment.

Comment 13: **Uncertainty, p. 42-43: Small sample sizes in analytical data lead to uncertainties in various parts of the risk assessment. These are not eliminated with an assumption that the site is adequately characterized. Assuming that "all individuals within a particular receptor group will receive the same dose" almost certainly introduces less uncertainty less than the use of myriad and unprovable default assumptions.**

Response: HLA acknowledges this comment.

Comment 14: Summary, p. 46: Direct measures of environmental concentrations could reduce uncertainty about attendant exposures and risks if the sample population is large. This was not the case at this site.

Response: HLA acknowledges this comment. The sampling strategy is discussed in the text.

Comment 15: Section 6.2, p. 49: Why is a vapor barrier required? Given the results of the risk characterization, it would seem that recommendations regarding landscaping should be stated more strongly.

Response: The vapor barrier was recommended to a) prevent moisture seepage from the underlying soil into the concrete which could cause the concrete to degrade, and b) provide an elastic barrier against possible dust and vapor infiltration in the event that the concrete cracks through the slab thickness.

Comment 16: Appendix H: This material is laid out extremely well. On page H-2 your values yield a daily ventilation of 15 m^3/day for adult residents, while on pages H-9 your default value of 1.4 m^3/hr for a worker yields 11.4 m^3/day over an 8 hr day. Bring your estimates into conformance with DTSC's recommended ventilation rates of 20 m^3/day both for adults in a residential scenario and for workers over an 8 hr day in a commercial or industrial scenario.

Response: HLA acknowledges the comment. DTSC-recommended ventilation rates may be considered in future risk assessments at similar sites. The results of the report are not expected to changes, therefore new calculations were not performed.

RESPONSE TO COMMENTS
SAN FRANCISCO REDEVELOPMENT AGENCY: 241 SIXTH STREET

A. General Comments

Comment 1: Since we have not reviewed the site characterization data, our review assumes that these data are accurate and complete, that acceptable sampling and analytical procedures were used, and that Regional staff have determined that the data reported accurately reflect the magnitude and extent of contamination at the site.

Response: HLA acknowledges this comment.

Comment 2: The document was reviewed for scientific content. Minor grammatical and typographical errors that do not affect the interpretation have not been noted. These should, however, by corrected in the final version of the document.

We noted dozens of grammatical errors, many more than seen in previous documents in this series. We also found calculations which did not track to their sources. <u>We take this as an indication that this document did not undergo adequate quality assurance and/or peer review</u>.

Response: The minor grammatical and typographical errors have been corrected. Additional quality assurance and peer review was performed and revisions are noted in the attachments using strikeouts and underlining (redlining).

Comment 3: As this document is revised and resubmitted to DTSC, every change that is made should be clearly identified. This may be done in several ways: by submitting revised pages with the reasons for the changes noted, by the use of strikeout and underline, by the use of shading and Italics, or by cover letter stating how each DTSC comment has been addressed. Any change In the document that have not been made In response to specific DTSC comments should be identified and the reason for the change specified.

Response: The pages revised by use of redlining are attached for agency approval prior to issuing a final document.

Comment 4: The risk assessment contains excessive use of initializations and acronyms. Such overuse appears throughout the document, but it is

nowhere more evident than in the section on "health-based levels" beginning on page 23 (RCRAc PS, tHBL, etc.). Use words.

Response: Use of initializations and acronyms has been decreased wherever practical in the existing document. Further decreases will be considered in future documents at similar properties.

B. Specific Comments

Comment 1: Data Quality, Sec. 3.4, p. 15-16 and Table 1: Circular reasoning is used regarding the adequacy of the site investigation. It is stated that lead and polynuclear aromatic hydrocarbons (PNA) are likely to be present at the site. These are sampled for and found. No other organic chemicals are sought. The circle is made complete with the assumption that these analyses adequately characterize the site.

The possible presence of other organic chemicals, especially volatiles, could have been of importance, given that the site is to be capped. If any evidence exists to indicate that volatiles are absent from this site, this evidence should be presented.

Response: The soil sample analytical parameters were developed based on the site history presented in Baseline Environmental Consulting's June 1991 report. Their report suggests that on-site sources of soil and groundwater contamination did not exist; chemical analyses were therefore restricted to compounds detected in fill placed at the site in the late 19th century and analyzed previously at nearby sites.

Comment 2: Chemical Analyses, Sec. 4.1.1 p. 18 and elsewhere: The site is twice referred to here as 1009 Mission street. This error is repeated periodically throughout the report and all the Appendices.

Response: The references to 1009 Mission Street have been corrected as shown in the attachments, where appropriate.

Comment 3: Background, Sec. 4.1.2. p. 19: The background values shown in Table 4-2 are very high for all metals shown. We were unable to find these numbers in Trace Metals in the Terrestrial Environment by D.C. Adriano (1986). These background values are not acceptable for California soils without further documentation.

Response: As indicated in the revised text to Section 4.1.2.1, the background values shown in Table 4.2 were for general information purposes only; therefore, the values were not closely scrutinized. The Frieberg et al. (*1986*) reference used at a similar property under review by DTSC was used for

consistency purposes. Footnotes have been added to clarify the references used to compile the background data. The Adriano, (*1986*) reference was used to clarify the barium and cobalt values.

Comment 4: **Chemicals of Concern: Eliminating detected chemicals by comparison to health-based levels is not a valid method of selecting chemicals of concern. Possible health effects of the chemicals eliminated are additive to the effects of the chemicals remaining after the screening procedure. Therefore, risks are underestimated by considering only the latter class of chemicals. The method is acceptable for 241 Sixth Street, because lead and polynuclear aromatic hydrocarbons would drive the risk assessment regardless. At other sites we will not accept the use of risk characterization procedures to eliminate chemicals of concern.**

Response: This comment is acknowledged by HLA and will be considered in future risk assessments of similar sites.

Comment 5: **Lead, Sec. 4.4.1. p. 29 ff.: No discussion is presented for lead in the pre-construction scenario. We estimate that the hazard ratio for children could be as high as 30 (6,000 ppm vs. 200 ppm). In addition, mention of lead is missing from the conclusions on page 35.**

Response: As shown in Section 4.4.1.3, the actual hazard ratios (HR) from exposures to lead during the pre- and post-construction scenarios were not calculated separately since the health-based level for a child resident of 200 mg/kg (Table 4-2) was available for comparison to assumed exposure point concentrations. Section 4.4.1.3 states the estimated HR is expected to be above 1, which is consistent with the DTSC comment. The HR was estimated to be above 1 for a construction worker during a construction scenario where a detailed site-specific blood-lead analysis was performed. Accordingly, the proposed actions at the site do not change.

The conclusions have been revised to reflect possible health risks from lead exposures.

Comment 6: **Uncertainty, p. 40: Low-dose extrapolations and species-to-species extrapolations introduce uncertainties orders of magnitude greater than the other items mentioned in the bullets on page 40. Emphasize the principal sources of uncertainty and their effect on the conclusions. Also, it seems appropriate to address here the uncertainties surrounding the estimated hazard index of 2 for thallium in the post-construction scenario. This is the only value from the risk characterization in the post-construction scenario which raises a question.**

Response: This comment is acknowledged and will be considered in future risk assessments of similar sites. A table that more specifically outlines the

expected order-of-magnitude difference to the overall conclusions of the report will be considered for future submittals. Uncertainties associated with thallium-related health risks have been added to the text as shown in the attachments.

Comment 7: **Table 2: Present the sample quantitation limits instead of "ND" so calculations of average concentrations can be verified.**

Response: The analytical laboratory detection limits are presented in a revised Table 3-2 (attached).

Comment 8: **Table 4.4: The ventilation rate for an adult in a residential scenario should be 20 m^3/day.**

Response: The DTSC-recommended ventilation rate may be considered in future risk assessments of similar properties. The results of the report are not expected to change; therefore, new calculations were not performed.

Comment 9: **Table 4-5a: The oral slope factor shown on for Cr^{+6} is "NA", while that in Table 4-5b is 0.42. Make the two tables consistent.**

Response: The tables are intended to be inconsistent because they were used for different purposes. As explained in Section 4.4 and as reflected in the different titles for Tables 4-5a and 4-5b, the toxicity values in Table 4-5a were used for COC selection, whereas the toxicity values in Table 4-5b were used for risk characterization. The difference in toxicity values was to consider recent 1992 EPA and Cal-EPA publications for the risk characterization section of the report.

Comment 10: **Table 4-6: Using default values and equations from Tables 4-3 and 4-4 and toxicity values from Table 4-5b, we were unable to reproduce many of the values shown in Table 4.6. In particular, total Health Based Levels for carcinogens for children could not be reproduced. The values in this table require another round of quality assurance. Also, values are shown for lead and nickel based on carcinogenicity via the oral route, but DTSC does not consider these metals to be carcinogenic by this route.**

Response: Health-based levels (HBLs) were calculated using the toxicity values presented in Table 4-5a, not Table 4-5b, as presented in Section 4.1.2, page 21. The HBLs received adequate QA/QC prior to issuing the draft report and are not being revised. EPA's Integrated Risk Information System (IRIS) classifies lead as a B2 carcinogen as indicated on Table 4-5a. IRIS was used as the main reference for compiling toxicity information. A footnote has been added to Tables 4-5a and 4-5b as

shown in the attachments to reflect Cal-EPA's position on nickel and lead.

Comment 11: Table 4-9: The mean values for chemicals of concern cannot be verified because sample quantitation limits are not shown in Table 3-2.

Response: The revised Table 3-2 which includes sample quantitation limits is provided in the attachments.

ate of California

Department of Toxic Substances Control

lemorandum

: Leonard Miller
Region 2 Site Mitigation Branch
700 Heinz Ave., Suite 200
Berkeley, California 94710

Date: May 19, 1993

RECEIVED

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larding Lawson Associates

om : Office of Scientific Affairs
400 P Street, Fourth Floor
P.O. Box 806
Sacramento, California 95812-0806

ıbject: San Francisco Redevelopment Agency Sites
(PCA 11020, Log #382):
A. 1009 Mission Street - Site 200324-00
B. 1028 Howard Street - Site 200323-00
C. 241 Sixth Street - Site 200322-00

BACKGROUND

Harding Lawson Associates (HLA), the contractors for the San Francisco Redevelopment Agency (SFRA), had followed the Department's Preliminary Endangerment Assessment (PEA) process and submitted the Site Assessment documents for the three subject sites. These documents were previously reviewed by Drs. Judith Parker and John Christopher of the Office of Scientific Affairs (OSA), and their comments were forwarded to HLA. OSA has now received HLA's response to those comments and the revised Site Assessment documents. This review addresses the adequacy of the responses and the submitted revisions.

DOCUMENT REVIEWED

1. HLA's point-by-point response to OSA's comments, addressed to Leonard Miller, DTSC.

2. Site Assessment, 1028 Howard Street, San Francisco. Volume I.

3. Site Assessment, 241 Sixth Street, San Francisco. Volume I.

These documents are all prepared for SFRA by Jeffrey Ludlow and Semiramis Ardalan of HLA and dated March 12, 1993.

GENERAL COMMENTS

Overall, the original comments and the corresponding responses are clearly indicated and easy to follow. When changes to the text are required, they are adequately stated and presented as strikeouts and underlines. New tables are prepared when major content changes are necessary. Comments specific to each site are presented in the next section.

SPECIFIC COMMENTS

A. Mission Street Site:

HLA has acknowledged the two comments by the OSA staff regarding the site characterization and the exposure scenarios used. No change to the text is required for this Site Assessment. In the memorandum dated October 1, 1992, the OSA staff judged that "this assessment is appropriate for use as a template for other similar properties".

B. Howard Street Site:

HLA's response to comments (Pages 2 - 8) along with the necessary text changes to Site Assessment, Volume I, have been reviewed. We will not comment further for those responses found to be adequate. In the following, GC and SC refer to General Comment and Specific Comment, respectively.

GC 3 - Since the revised Tables 4-27 through 4-44 are not furnished, you may want to verify that appropriate editorial revisions have indeed been made in the footnotes to these tables.

SC 2 - New Table 3-2 is a vast improvement from the previous version, e.g., ND (not detected) is followed immediately by the detection limit for the chemical.

SC 6 - HLA acknowledged that "small sample sizes will be considered in future site investigations". However, more importantly, the RP and its contractors must be made aware that the term Frequency of Detection (FOD) can be very misleading when so few samples were taken at this site. No sound scientific judgment can be made on FOD of zero or 100% when these values are derived from <u>one</u> sample! Table 4-1 is acceptable where FOD values are preceded by "Number of Detects" and "Number of Analyses". Table 4-2, where only FODs are listed, must indicate the number of detects and analyses, or make clear reference to the source of FODs (Table 4-1?).

SC 7 - RP indicated that indeno(1,2,3-cd)pyrene was not detected at the site and thus was not listed in the new Table 3-2. This is acceptable as long as the practice is consistent.

SC 16 - Dr. Christopher requested that HLA "bring your estimates into conformance with DTSC's recommended ventilation rates of 20 m^3/day" (for humans). HLA acknowledged the comment but no new calculations were performed because, according to HLA, "the results of the report are not expected to change". This type of approach has been used by HLA throughout its response to DTSC's comments. We agree that new calculations will probably have no significant effects on final health risk estimates. However, a human breathing rate of 20 m^3/day has long been a standard default. We expect to see 20 m^3/day used as a default value for ventilation rate in the future for adults in a residential scenario.

C. Sixth Street Site:

Again, HLA's response to comments (Pages 9 - 13) along with the necessary text changes to Site Assessment, Volume I, have been reviewed. We will not comment further for those responses found to be adequate. In the following, GC and SC refer to General Comment and Specific Comment, respectively.

SC 5 - HI (Hazard Index), HR (Hazard Ratio), and HQ (Hazard Quotient) are used extensively in Section 4 and in the corresponding tables. If indeed they are used interchangeably, please use only one of them throughout (HI preferred) to minimize confusion. Also, the accuracy of HIs (or HRs or HQs) does not exceed one or two significant figures. Tables in Sec. 4 show three (or more) significant figures for HIs (or HRs or HQs). This should be corrected in future revisions.

SC 8 - Again, HLA used an adult ventilation rate of 15 m^3/day instead of 20 m^3/day and no new calculations were made, because "the results of the report are not expected to change". Please refer to the comment above on SC 16, Howard Street Site.

CONCLUSION

My concluding remarks are as follows:

1. I must reiterate the statement made by Dr. Christopher that we have not scrutinized the site characterization data and we did not visit these sites. So we are relying on your judgment, as the site manager, that the site data accurately reflect the extent and magnitude of contamination at these sites.

2. I agree with Dr. Christopher that the previous version of Site Assessment documents contained many careless errors and evidence of poor quality assurance and/or peer review. Improvements made in the current version are adequate.

3. Almost all of Dr. Christopher's comments have been adequately addressed by HLA. However, several changes suggested by Dr. Christopher were not made because no significant effects would result. Instead, HLA repeatedly stated that "(the comments) will be considered in future risk assessments (and/or document submittals) for similar properties". I agree that these suggested changes will probably not affect the health risk assessment significantly. Therefore, these changes may be set aside for the current documents. However, we expect to see DTSC-approved default values used in future submittals, unless justification for different values is provided.

Cheng L. Liao

Cheng L. Liao, Ph.D., DABT
Staff Toxicologist

Reviewed by: John P. Christopher, Ph.D., DABT
Staff Toxicologist

cc: Michael J. Wade, Ph.D., DABT
Senior Toxicologist

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PETE WILSON Governor

RECEIVED
MAY 28 1993
Harding Lawson Associates

May 25, 1993

Mr. William Rumpf
San Francisco Redevelopment Agency
770 Golden Gate Ave.
San Francisco, California 94102

FINALIZING THE PEA AND RISK ASSESSMENTS DOCUMENTS FOR 1009 MISSION ST., 1028 HOWARD ST., AND 241 SIXTH ST.

Dear Mr. Rumpf:

The purpose of this memo is to acknowledge that the PEA Documents and the Health Risk Assessments are complete for the subject sites. The issues which remain are those outlined in the memo of November 16, 1992 from Barbara Cook to the Redevelopment Agency. I have enclosed the comments of Cheng L. Liao, Staff Toxicologist, Office of Scientific Affairs, who reviewed the revised documents.

I would like to support Dr. Christopher's comment about HLA's reluctance to change the numbers used for breathing rates. I do not understand the approach of HLA to this issue. All that could be involved is changing a number on a spreadsheet and allowing the software to run. The Department will expect to see the generally agreed upon default values in future risk assessments.

If the Agency has other sites which it feels require Departmental involvement, I would strongly urge that the Department be consulted prior to gathering the data which will be used for a risk assessment. The Department would like to see more soil samples. For sites where a physical barrier is being proposed, sufficient testing should be done to establish the absence of those materials which could penetrate the barrier. The Department feels that relying on the site history is insufficient.

Mr. William Rumpf
May 25, 1993
Page Two

Please send two copies of the finalized documents to my attention.

Sincerely,

Leonard Miller

Leonard Miller
Associate Hazardous Materials Specialist

Enclosure

cc: Bill Lee
San Francisco Public Health Dept.
101 Grove Street, Room 207
San Francisco, Califoria 94102

Jeffery Ludlow, Harding Lawson Associates
303 Second Street, Suite 630N
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APPENDIX D

RISK ASSESSMENT FOR 1009 MISSION STREET SITE
(EXCERPTS FROM PEA REPORT)

4.0 HUMAN HEALTH AND ENVIRONMENTAL THREAT ASSESSMENT

A BRA for the site was prepared in accordance with guidelines established by the DTSC (*DHS, 1990b,c; Cal-EPA 1992b,c*) and EPA (*EPA, 1989a; 1990a,b, 1991d*). The proposed development of the site for residential housing presents several health risk issues: 1) health and safety issues associated with construction activities, 2) potential health risks to future residents if no remedial action is taken, and 3) potential further degradation of the groundwater quality below the site and to the bay due to chemicals detected in the site soils.

The purpose of the BRA is to derive numerical estimates of the potential human health risks associated with the chemicals detected at the site, in the absence of remediation, and to qualitatively evaluate any potential health impacts to the environment. Calculations of health risks were performed for three future hypothetical scenarios: a) baseline conditions pre-construction, whereby pavement is not expected to act as a barrier to chemical release to residential populations, b) baseline conditions during construction, whereby the level of potential chemical releases is expected to increase as a result of construction activities, and c) baseline conditions post construction whereby potential contact with chemicals may occur post development of the site.

Therefore, the following receptor populations were evaluated for average and reasonable maximum exposure (RME) scenarios: hypothetical onsite resident pre-construction; onsite construction workers, offsite workers, and offsite residents (children and adults) during construction; and future onsite residents post construction. This evaluation provides risk information necessary for evaluating the remedial alternatives proposed for the site, as well as for determining health and safety and risk management measures that should be implemented prior to initiating construction

activities. The results of this report will be used to recommend mitigative and risk management measures during construction to minimize on- and offsite public and environmental exposures to site chemicals.

The following sections detail the methods and results of the BRA.

4.1 Identification of Chemicals of Concern

This section presents the methods used to select chemicals of concern (COCs) for the site. COCs were selected so that the most prevalent, mobile, persistent, and toxic compounds detected at the site (i.e., those chemicals that represent the greatest potential threat to human health) were quantitatively evaluated in the BRA and represent the classes of compounds detected at the sites. The following criteria were considered in the selection process: EPA's "weight of evidence" (WOE) designations of the carcinogenicity of a chemical, the frequency of detection (FOD) of a chemical at the site in soil, comparison of detected soil concentrations with regional soil background levels, and comparison of detected concentrations with health-based standards. The individual screening criteria are discussed below.

4.1.1 Chemical Analyses

The results of sampling activities (Sections 1.0 through 3.0) conducted by HLA at the site provided the basis for the COC selection process. Any data gaps associated with this dataset are presented in Section 4.8 (Sources of Uncertainties). For the purposes of this assessment, the results for soil are considered representative of the soils at 1009 Mission Street; other sites similar to 1009 Mission Street's history generally present the same range of chemical concentrations (*HLA, 1991a-e*).

For the purposes of this BRA, soil analytical results for individual chemicals detected at all depths and boring locations (Table 3-2) were combined in the statistical

treatment of the data. Therefore, for the purposes of this BRA, this dataset is assumed to represent chemical soil concentrations across the entire surface of the site, down to a depth of 22.5 feet bgs, which is a very conservative assumption since exposures to a depth of 22.5 feet bgs are not expected. A summary of this statistical analysis is presented in Table 4-1 which presents the FOD, the minimum and maximum concentrations detected, the arithmetic mean concentration, the standard deviation on the arithmetic mean, and the 95-percent upper confidence level (UCL) of the arithmetic mean. For those chemicals detected in some samples but not in others, a concentration equal to one-half the detection limit was conservatively used to represent non-detects in the statistical treatment of the data, consistent with EPA guidance (*EPA, 1989a*).

The FOD maximum and arithmetic mean concentrations were used to summarize the screening criteria described below (Tables 4-2 through 4-6). Table 4-7 presents a summary of these results. As shown, any chemicals that were analyzed but not detected (i.e., FOD of 0%) in any of the soil samples were not considered further in the COC selection process. As shown, any chemicals with a weight of evidence (WOE) signifying the chemical is a known potential carcinogen was selected as a COC as long as other criteria were not exceeded. Further details are presented below.

4.1.2 Comparison of Chemical Concentrations to Screening Values

Background Concentrations

Maximum and arithmetic mean concentrations of metals were compared to the literature-referenced regional background data presented in Table 4-2 ETI, 1988; Frieberg et al, 1986; (*Adriano, 1986; HLA 1991e*). Background data for metals and organics were not collected specifically for the site. As summarized in Table 4-7, any metals with site concentrations exceeding these background levels were retained for

further consideration as a COC, pending the results of the other screening criteria. If other criteria were not exceeded, the chemical was excluded from further evaluation.

Health-Based Regulatory Levels

RCRA soil action levels for noncarcinogens (RCRAn ALs), RCRA minimum media protection standards for carcinogens (RCRAc PS min; *EPA, 1990d*), and California soil applied action levels (AALs; *DHS, 1990a; DTSC, 1992a*), are also presented in Table 4-2 for each detected chemical. It should be noted that RCRAn AL, RCRAc PS mins, and AALs are health-based criteria developed according to EPA and DHS methods, respectively. The values presented are guidelines for evaluating soil concentrations detected at sites. Chemical concentrations above these RCRA or AAL levels may warrant further investigation; however, these values are not considered to be site-specific, health-based target cleanup levels (TCLs).

Other Health-Based Levels

As shown on Table 4-2, regulatory values were not available for most of the chemicals detected onsite. In the absence of regulatory-established criteria, conservative health-based levels for carcinogens (HBLc) and noncarcinogens (HBLn) were estimated. HBLs are calculated concentrations of chemicals in soil based on specific assumptions and target risk levels, as described below.

HBLs are estimated using similar methods to those used in estimating preliminary remediation goals (PRGs) in accordance with EPA guidelines (*EPA, 1989a; 1990c; 1991a-f*), and are appropriate screening criteria for COC selection.

To estimate HBLs, the potential human health effects to adult workers such as construction workers and to a residential population (children and adults) were considered for each of the chemicals detected at the site. The exposure scenarios

considered in estimating total HBLs (tHBLs) were based on the primary pathways of exposure associated with soil: inhalation of particulates, ingestion of soil, and dermal contact with soil. Inhalation of vapors was not considered in the estimation of HBLs since the chemicals detected at the site are not considered highly volatile. These HBLs are estimated similar to the RCRA levels described above except that tHBLs consider cumulative exposures from three pathways of exposure; therefore, tHBLs are a more conservative screening method than described above.

The equations and assumptions used to estimate tHBLs for carcinogens and noncarcinogens (tHBLc and tHBLn, respectively) for adult construction workers and residents (children and adults), are presented in Table 4-3 and 4-4, respectively. Human intake assumptions (Tables 4-3 and 4-4) and toxicity values (Table 4-5a) used to calculate tHBLs are consistent with EPA methods.

As shown, for each of the site chemicals with available RfDs, the tHBLn values were estimated so that allowable daily intakes (doses) equated to the acceptable daily intakes (RfDs). For each of the site chemicals with available SFs, the tHBLc values were conservatively estimated to be protective of 1-in-1,000,000 potential exposed individuals of developing cancer (i.e., 1×10^{-6}; EPA, 1989a). This results in more health protective values to screen against than the Cal-EPA target criteria of 1-in-100,000 probability of an exposed individual developing cancer (i.e., 1×10^{-5}).

As shown, all carcinogenic PNAs were conservatively set equivalent to benzo(a)pyrene [B(a)P] consistent with Cal-EPA guidelines (*Cal-EPA, 1992b*). As shown in Table 4-5a, B(a)P is the only carcinogenic PNA that has been assigned a toxicity value, a slope factor (SF), by both the EPA (*1991e,f; 1992a,b*) and the DTSC (*1992b*). One method DTSC currently requires is that all carcinogenic PNAs be treated

equivalent in toxicity to the carcinogenic potential of B(a)P. Because B(a)P is considered the most potent carcinogenic PNA studied to date, assuming that all carcinogenic PNAs are equivalent in potency to B(a)P represents a conservative assumption (see Section 4.8).

As shown in Table 4-6, lead lacks an EPA or DTSC-recommended toxicity value such as SFs and reference doses (RfDs; Table 4-5a). Two specialized exposure models have been developed to characterize exposures to lead (*EPA, 1990a*; *DHS, 1992c*). Based on HLA's experience on other DTSC regulated sites with lead contamination, the tHBLs assigned to lead, as shown on Table 4-6 and based on similar intake assumptions to those presented in Tables 4-3 and 4-4, are generally 200 mg/kg for a child resident, 2,000 mg/kg for an adult resident, and 1,000 mg/kg for an adult construction worker. These models are described in detail in Appendix H.

The tHBLs were compared to the site maximum and arithmetic mean concentrations as shown in Table 4-7. Any chemicals with soil concentrations in excess of the tHBLs were retained as a COC. Any chemicals with soil concentration less than tHBLs were excluded as a COC and not further evaluated as a COC.

4.1.3 Chemicals of Concern

In summary, using the maximum and the arithmetic mean detected concentrations (Table 4-1), various comparisons were made to the screening criteria described above and were presented in Table 4-7. As shown, the maximum and arithmetic mean concentrations for arsenic, copper, lead, and zinc were above background concentrations. Soil concentrations of arsenic, carcinogenic PNAs (benzo[a]anthracene, benzo[a]pyrene, benzo[k]fluoranthene, chrysene and ideno[1,2,3-cd]pyrene), chromium as hexavalent chromium (chromium VI), lead, and thallium exceeded the lowest tHBL and, therefore, were selected as COCs. Arsenic and chromium VI have a weight of evidence of A;

therefore, they were retained as COCs. Nickel, evaluated as refinery dust, although an A carcinogen for the inhalation pathway, did not exceed the lowest tHBL and was therefore excluded as a COC. On the basis of the methodology presented in this section, the following chemicals were selected as COCs and considered representative of the classes of compounds detected at the site:

- Arsenic
- Chromium (as Chromium VI)
- Lead
- Thallium
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Indeno (1,2,3-cd) pyrene.

These COCs were used in the risk characterization (Section 4.4) presented below to represent health risks from potential additive exposures to a mixture of these COCs. Although total oil and grease (TOG) was detected at the Mission Street site, TOG was not evaluated in the BRA since toxicity values have not been developed for TOG. The toxicity of the COCs are detailed in the toxicological profiles provided in Appendix D. The exposure pathways related to the COCs are discussed below.

4.2 Exposure Assessment

4.2.1 Air Pathways

Both on- and offsite air conditions may be impacted by chemical-laden soil particles (fugitive dusts) and chemicals volatilizing from soil. The potential for inhalation of dusts or volatiles is based on factors such as the nature of surface cover at the site (e.g., dirt, vegetation, pavement), soil moisture, soil temperature, the physical and chemical properties of chemicals detected in soil, chemical concentrations detected

at the site, meteorological conditions in the area, and the level of activity resulting in disturbance of the soil. Chemicals that adsorb strongly to soil, such as the metals and carcinogenic PNAs detected in soils at the site, may potentially impact ambient air quality in the form of dust particles, especially assuming no surface cover during high wind conditions and/or during movement of vehicular traffic over erodible surfaces of the site. This is of particular concern during planned construction activities at the site. carcinogenic PNAs, rated as moderately volatile, may migrate to the surface in the form of vapors, especially if the site soils are not encapsulated. These air pathways are considered potential health risks to on- and offsite receptors and were therefore further considered as detailed below.

4.2.1.1 Chemical Vapors

Potential inhalation exposures to volatile emissions were evaluated by first performing a conservative quantitative screening evaluation assuming no surface cover. As detailed in Appendix E, given the relatively low soil concentrations detected for carcinogenic PNAs at the site (Table 4-1) and the low volatility of these compounds, carcinogenic PNAs at 1009 Mission Street do not constitute a health hazard at the concentrations detected in soil via chemical vapor generation. Therefore, the inhalation of volatile emissions during construction and post-construction is not expected to be a pathway of concern at 1009 Mission Street and therefore is not further considered in the BRA. Any potential vapor releases can be monitored during construction using air monitoring equipment. Encapsulation of the site with a building foundation is expected to make any volatile emissions available for public health exposures negligible.

4.2.1.2 Fugitive Dust

Since the site can be assumed to be without a surface cover under baseline conditions and since it is expected that construction activities would significantly increase the levels of dust emissions, inhalation of respirable air concentrations of chemicals adsorbed to entrained dusts during pre- and during construction scenarios were evaluated. Exposure scenarios were developed assuming pre-construction indoor and outdoor inhalation of dust exposures to a hypothetical onsite residential population, under baseline conditions. Onsite construction workers and offsite receptors (workers and residents) were assumed to inhale airborne dusts with concentrations of chemicals originating in site soils, during construction activities. Inhalation of indoor air by future onsite residents, post-construction, assuming a potential crack in the building foundation was also considered. Exposure point concentrations for pre-, during, and post-construction scenarios are presented in Tables 4-9, 4-10, and 4-11, respectively (see Section 4.3).

4.2.2 Soil Pathways

Humans may incidentally ingest soil and dermally contact soils containing site COCs; therefore, these pathways were evaluated in the RA in pre-, during and post construction scenarios.

During construction, because the site is fenced and access is restricted to construction workers, offsite commercial and residential receptors are not expected to come into direct contact with site soils. Besides construction workers coming into direct contact with site soils during construction activities, soil particles from the site may become airborne during the course of site development and the airborne particles may be carried to offsite locations by the prevailing winds. These particles can ultimately deposit and collect at offsite commercial and residential locations. Therefore, offsite

worker and resident exposures associated with ingestion of soil, dermal contact with soil, inhalation of dusts, and ingestion of homegrown fruits and vegetables were evaluated during a construction scenario. Exposure point concentrations estimated to evaluate these scenarios are presented in Tables 4-9, 4-10, 4-11 for pre-, during, and post-construction scenarios (see Section 4.3). Both baseline pre-construction and post construction scenarios assuming residential exposures from direct contact were also considered in the BRA. Pre-construction scenarios were developed assuming residents come into contact with chemicals available for contact as a result of no surface cover and no remedial action to prevent exposures. Post-construction scenarios were developed assuming a potential crack in the building foundation potentially making chemicals in soils available for future contact. Both these scenarios are conservative since remedial alternatives can be implemented to reduce exposures to negligible levels.

4.2.3 Groundwater Pathways

Groundwater exposure scenarios (e.g., drinking water, inhalation of chemical vapors, or dermal contact) associated with the site were not evaluated in the BRA based on the detailed discussion in Section 2.5.2 and the environmental threat assessment discussed in Section 4.8.

4.2.4 Summary

Based on the above evaluation, the receptors and exposure pathways summarized in Table 4-8 were quantified in the risk characterization (Section 4.4).

4.3 Exposure Point Concentrations

On the basis the COCs, the potentially exposed populations, and the relevant exposure pathways, exposure points for the receptors were selected. Exposure points are

locations at which individuals or populations could potentially be exposed to chemicals originating at the site. The chemical concentrations reported in Table 4-1 were used to estimate concentrations expected to be of concern in air, soil and fruits and vegetables (exposure point concentrations). Chemical concentrations were conservatively assumed to remain constant over time (i.e., no degradation) during average and RME scenarios. This assumption overestimates exposure point concentrations since the concentrations of the COCs are expected to decrease over time due to physical, chemical, or biological influences.

Exposure point concentrations for each of the receptors are summarized in Tables 4-9 through 4-11. As shown, consistent with EPA guidance (*1989a*), the arithmetic mean was used for the average scenarios and the lesser of the 95-percent UCL and maximum for the RME scenario. For pre-construction scenarios, exposure point concentrations were based on Table 4-1. Outdoor air concentrations were not separately modeled but estimated based on a 0.07 mg/m^3 respirable fraction of soil levels (*Hawley, 1985*; Table 4-9). Appendix E, F, and G detail the methods for deriving the exposure point concentrations in air, soil, and fruits and vegetables for during construction scenarios, as summarized in Table 4-10. Post construction exposure point concentrations were not separately modeled and complex probability statistics were not used to estimate the probability of a building foundation cracking and the probability of an individual contacting a specific concentration of a chemical at the crack location. Instead, a conservative and simple fraction of ten percent was applied to the exposure point concentration summarized in Table 4-9 to show a reduction in exposure due to a building foundation. It is expected that a building foundation would provide much more protection to human population than what was assumed herein (see Section 2.5.1.4

and 6.0) and the exposure point concentrations would be far lower if not negligible to those shown on Table 4-11.

4.4 Risk Characterization

The exposure point concentrations were used to quantify noncarcinogenic adverse health effects and carcinogenic risks. The methods and assumptions are detailed in Appendices H, I and J. The toxicity values used in risk characterization are presented in Table 4-5b (these were updated from Table 4-5a due to recent publications from EPA and Cal-EPA). The other intake assumptions used in estimating human daily intakes (doses) are presented in Tables 4-12 to 4-23. The results of the risk characterization for multipathway exposures to a mixture of the COCs (except lead) are presented in Tables 9-24, 9-25, and 9-26 for pre-, during and post-construction scenarios. Sum total risks for multipathway exposures were obtained by summing the results of sum total exposures to a mixture of COCs (except lead) as presented in Tables 4-27 through 4-44. For these scenarios, estimated risks exceeding the EPA target risk range (one-in-100,000 probability that an exposed individual would develop cancer from potential exposure to carcinogens; i.e., 1×10^{-5}) or threshold levels for noncarcinogenic health effects are presented.

The results presented in Tables 9-24 through 9-26 are a conservative method for discussing exposures to all chemicals (except lead) since a receptor may not be exposed to these chemicals or pathways all at once, especially RME pathways. As a separate evaluation for exposures to lead, blood lead levels in potentially exposed individuals were estimated and compared to an acceptable blood level of 5.68 micrograms per deciliter (μg/dl; Appendix I). Additionally, for the Proposition 65 evaluation, doses in micrograms per day (μg/day) were compared to the published No

Significant Risk Level (NSRL; Appendix J) for during construction scenarios only. For chemicals known to be potential carcinogens based on Proposition 65 (arsenic, carcinogenic PNAs, chromium VI) or reproductive toxins (lead), the Proposition 65 assessment was performed and is included in Appendix J. The following summarizes the results of the risk characterization for all receptors and pathways presented in Table 4-8 for each of the evaluations presented above.

4.4.1 Noncarcinogenic Hazard Indices

The following sections present the predicted noncarcinogenic HIs for the site for each hypothetical receptor population for the pre-, during, and post-construction scenarios.

4.4.1.1 Pre-Construction Scenarios

The following section presents the predicted noncarcinogenic HIs for the site for hypothetical onsite residents during the pre-construction scenarios.

Hypothetical Onsite Residents

Child/Adult Residents

As shown in Table 4-24, the HIs from the multipathway exposures to COCs detected in soil are estimated to be 30 and 40 for the average and RME scenarios, respectively. The HIs for both scenarios exceed 1. As shown in Tables 4-27 and 4-28, the exposure pathways with the greatest contribution to the average and RME HI are estimated for ingestion and dermal contact with soil due to thallium; ingestion exposures to arsenic are estimated to be slightly in excess of 1.

Adult Residents

As shown in Table 4-24, the HIs from the multipathway exposures to COCs detected in soil are estimated to be 4 and 5 for the average and RME scenarios,

respectively. The HIs both scenarios exceed 1. As shown Tables 4-27 and 4-28, the exposure pathways with the greatest combination to the average and RME HI are estimated for ingestion of and dermal contact with soil due to thallium.

4.4.1.2 <u>During Construction Scenarios</u>

The following section presents the predicted non-carcinogenic HIs for the site for onsite construction workers and offsite office and commercial workers and residential populations during construction.

<u>Onsite Construction Workers</u>

As shown in Table 4-25, the HIs from the multipathway exposures to COCs in soil are estimated to be 1 and 2 for the average and RME scenarios, respectively. The HI for the RME scenario exceeds 1. As shown in Table 4-32, the exposure pathway with the greatest contribution to the RME HI are estimated for ingestion of soil primarily due to cumulative exposures to the COCs; individually the estimates for the COCs do not exceed 1.

<u>Offsite Office Workers</u>

As shown Table 4-25, the HIs from the multipathway exposures to COCs detected in soil are 2×10^{-3} and 3×10^{-3} for the average and RME scenarios, respectively. The HIs from the sum of all pathways for both scenarios are less than 1.

<u>Offsite Child/Adult Residents</u>

The HIs from the multipathway exposures to COCs detected in soil are 9×10^{-3} and 4×10^{-2} for the average and RME scenarios, respectively (Table 4-25). The HIs from the sum of all pathways for both scenarios are less than 1.

Offsite Adult Residents

The HIs from the multipathway exposures to COCs detected in soil are estimated to be 1×10^{-3} and 5×10^{-3} for the average and RME scenarios, respectively (Table 4-25). The HIs from the sum of all pathways for both scenarios are less than 1.

4.4.1.3 Hazard Ratios for Lead - During Construction Scenario

As presented in Appendix I and summarized in Table I-4, the blood lead levels were found to exceed "acceptable" levels for construction workers for average and RME exposures, based on the lead exposure point concentrations summarized in Table 4-10. The HRs were 9 and 22 which exceed 1.0. The exposure pathway with the greatest contribution was the ingestion of soil. The HRs estimated for offsite receptors are less than 1.0.

As shown in Tables 4-9 and 4-11 lead concentrations for pre- and post-constructions scenarios, respectively, exceed child tHBL concentrations (Table 4-2) for lead of 200 mg/kg; therefore, estimated HRs would be expected to be above 1.

4.4.1.4 Post-Construction Scenarios

The following section presents the predicted noncarcinogenic HIs for the site for onsite residents for the post-construction scenario.

Onsite Residents

Child/Adults Residents

As shown in Table 4-26, the HIs from the multipathway exposures to COCs detected in soil are estimated to be 3 and 4 for average and RME scenarios, respectively. The HIs for both scenarios exceed 1. As shown in Table 4-42 and 4-43, the exposure

pathways with the greatest contribution to the average and RME HI are estimated for ingestion and dermal contact with soil primarily due to thallium.

Adult Resident

As shown in Table 4-26, the HIs from the multipathway exposures to COCs detected in soil are estimated to be 4×10^{-1} and 5×10^{-1} for average and RME scenarios, respectively. The HIs for both scenarios are less than 1.

4.4.2 Carcinogenic Risks

Cancer risk predicted from exposures to chemicals at the site are presented in detail below. All cancer risk estimates were compared to the level of 1×10^{-5}.

4.4.2.1 Pre-Construction Scenarios

Hypothetical Onsite Residents

Child/Adult Residents

As shown in Table 4-24, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be 3×10^{-4} and 3×10^{-3} for average and RME scenarios, respectively. The cancer risk estimates for both scenarios exceed the DTSC level of 1×10^{-5}. The average and RME exposure pathways with the greatest contribution are estimated for ingestion of soil (2×10^{-4} to 5×10^{-4}) due to arsenic (1×10^{-4} to 2×10^{-4}) and carcinogenic PNAs which range from 7×10^{-6} to 1×10^{-4} as shown in Table 4-28, and dermal contact with soil (9×10^{-5} to 2×10^{-3}) containing arsenic (1×10^{-5} to 6×10^{-5}) and carcinogenic PNAs which range from 1×10^{-5} to 6×10^{-4}, as shown in Table 4-27.

Adult Residents

As shown in Table 4-24, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be 5×10^{-5} and 1×10^{-3} for average and RME scenarios, respectively. The cancer risk estimates for both scenarios exceed the DTSC level of 1×10^{-5} . The same patterns are noted for the adult resident as shown in Tables 4-27 to 4-28 for a child/adult.

4.4.2.2 During Construction Scenario

The following sections present the predicted carcinogenic risks for the site for onsite construction workers and offsite office and commercial workers and residential population during construction.

Onsite Construction Workers

As shown in Table 4-25, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be 1×10^{-6} and 5×10^{-5} for average and RME scenarios. The center risk estimates for the RME scenario exceed the DTSC level of 1×10^{-5}. As shown in Tables 4-25 and 4-32, the exposure pathways with the greatest contribution are estimated for dermal contact with soil (2×10^{-5}) and ingestion of soil (2×10^{-5}) primarily due to cumulative exposures to all COCs; individually the estimates for the COCs do not exceed 1×10^{-5}.

Offsite Office and Commercial Workers

As shown in Table 4-25, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be 9×10^{-8} and 2×10^{-6} for average and RME scenarios. The cancer risk estimates for both scenarios are less than the DTSC level of 1×10^{-5}.

Child/Adult Residents

As shown in Table 4-25, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be $4x10^{-7}$ and $7x10^{-6}$ for average and RME scenarios. The cancer risk estimates for both scenarios are less then the DTSC level of $1x10^{-5}$.

Adult Residents

As shown in Table 4-25, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be $6x10^{-8}$ and $1x10^{-6}$ for the average and RME scenarios. The cancer risk estimates for both scenarios are less then the DTSC level of $1x10^{-5}$.

4.4.2.3 **Post-Construction Scenario**

The following sections present the predicted cancer risk estimates for the site for onsite residents for the post-construction scenario.

Child/Adult Resident

As shown in Table 4-26, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be $3x10^{-5}$ and $3x10^{-4}$ for the average and RME scenarios, respectively. The cancer risk estimates exceed the DTSC criteria of $1x10^{-5}$ for average and RME scenarios. As shown in Table 4-42 and 4-43, the exposure pathways with the greatest contributions are estimated for dermal contact ($4x10^{-5}$ to $3x10^{-4}$) and ingestion of soil ($2x10^{-5}$ to $5x10^{-5}$) primarily due to arsenic and cumulative exposures to carcinogenic PNAs. For the average scenarios, exposure estimates primarily from cumulative mixture of COCs exceed 1×10^{-5}.

Adult Residents

As shown in Table 4-26, the cancer risk estimates from multipathway exposures to COCs detected in soil are estimated to be $5x10^{-6}$ and $1x10^{-4}$ for the average and RME

scenarios, respectively. The cancer risk estimates exceed the DTSC level of $1x10^{-5}$ for the RME scenario. As shown in Tables 4-42 and 4-43, the RME exposure pathways with the greatest contribution are estimated for dermal contact with soil ($1x10^{-4}$) and ingestion of soil ($2x10^{-5}$) due to arsenic and cumulative exposures to carcinogenic PNAs.

Trench Workers

Although exposures were not separately quantified, it is expected that exposures to a trench worker potentially contacting soils containing detectable concentrations of the COCs would be equal to or less than those estimated for adults, and in fact may be negligible since the exposure duration may be very short. In addition, worker exposures can be reduced by implementing health and safety measures that would reduce the likelihood of any exposures occurring at the site.

4.5 Comparison with Proposition 65 Criteria - During Construction Scenario

Chronic daily intakes for carcinogens (CDI_cs) calculated for the BRA were also converted to average daily doses in units of μg/day for three COCs: arsenic, B(a)P, and chromium VI. For the purposes of this report, the Proposition 65 evaluation was not performed for lead since a thorough evaluation was performed in Appendix I and the lead NSRL does not reflect current research on acceptable blood lead levels. Chemicals are listed under California Proposition 65 (*HWA. 1988*) with NSRLs expressed in μg/day.

Appendix J describes the methods used to compare calculated doses of chemicals (CDI_cs), from Tables 4-16 to 4-18 for onsite concentration workers with these Proposition 65 NSRLs. Onsite construction workers, the group expected to have the highest exposure to site contaminants, were selected for this analysis. From the results shown in Table J-1, only chromium VI is estimated to exceed the NSRL of 0.001 μg/day.

4.6 Conclusions of Baseline Risk Assessment

Pre-Construction Scenario/Hypothetical Future Onsite Residents

- Noncarcinogenic adverse health effects for both average and RME scenarios may be expected from dermal contact and ingestion of soil containing lead and thallium, especially by children, assuming site conditions as being unpaved; whereby, all chemicals in soil are made available for contact for residential population and risk management measures are not implemented to prevent exposures.

- In addition to the above, excess cancer risks may be expected due primarily to dermal contact and ingestion of soil due to arsenic and carcinogenic PNAs for average and RME scenarios. Estimates for inhalation of indoor air dusts by children for the RME scenario slightly exceed DTSC target risk criteria. Again, these scenarios conservatively assume barriers and risk management measures are not developed for the site to prevent exposures to a population such as residential children.

During Construction Scenario, Construction Workers

- Noncarcinogenic adverse health effects may be expected from incidental ingestion of soil by onsite construction workers primarily due to lead and cumulative exposures to a mixture of COCs, under baseline conditions, whereby health and safety measures are not implemented to prevent exposures during construction activities.

- Excess cancer risks are not expected for any exposure pathway under the average scenario. Under the RME scenario, excess cancer risks may be expected from dermal contact and incidental ingestion of soil by onsite construction workers, due mostly to cumulative exposures from COCs in soil.

- Exposure to chromium VI from ingestion of soil is expected to be slightly in excess of the Proposition 65 NSRL, assuming a worst-case scenario for onsite construction workers.

During Construction Scenario - Offsite Residents/Workers

- Exposures to offsite residents and workers are not expected as a result of construction activities and may in fact be negligible especially if risk management measures are implemented during construction.

Post-Construction - Onsite Residents

- Noncarcinogenic adverse health effects may be expected from dermal contact and ingestion of soil containing lead and thallium especially for children, assuming a release of soil from a potential crack in the future building foundation encapsulating the site.

- Excess cancer risks may be expected from ingestion of soil due to arsenic and carcinogenic PNAs especially under dermal contact and RME scenarios for children. Again, this conclusion is based on the unlikely event that a crack in the foundation would make soil available for direct contact exposures.

Based on the above conclusions, it is expected that 1009 Mission Street may present health risks to hypothetical future residents assuming that the site soil is not encapsulated by pavement or a building foundation that would sustain seismic activity. Onsite construction workers may also be impacted assuming baseline conditions (i.e., no risk management measures). On the basis of these conclusions and the results of the site investigations, it is expected that construction plans and remedial alternatives can be developed for the site so as to minimize, if not present negligible exposures to construction workers, on- and offsite workers and residents, pre-, during and post-construction of the site. These alternatives are detailed in Section 6.0.

Based on the highly conservative scenarios used in the BRA, it is expected that actual risks from exposures to the COCs originating from the site are not likely to exceed risks from the RME scenario, and are, likely to be much lower than the risks predicted from this evaluation. Further details on the level of uncertainty in this report and the level of conservation in the methods used in the final results are presented in Section 4.8.

4.7 Environmental Threat Assessment

Under baseline conditions, sensitive, endangered or threatened species identified in the greater San Francisco Bay Area do not frequent the 1009 Mission Street site. This site is not used as a main source of food and shelter for terrestrial or aquatic wildlife. Also, the site is fenced and is in an urban setting. Sensitive avian species do not frequent the site as there is minimal vegetation, and surface water habitats and shelters

do not exist at the site. Additionally, the area is not currently part of any park or designated scenic area. Therefore, the site is not expected to pose a threat to wildlife. Any potential impacts to the bay as a result of groundwater below the site potentially reaching the bay are considered negligible and a regional problem, as discussed in Section 2.5.2. Any potential threats to the environment are expected to be reduced and made negligible if the site were encapsulated with a building foundation.

4.8 Sources of Uncertainty

EPA guidelines for RA are intended to promote technical quality and consistency in the RA process (*EPA, 1989a*). In addition to providing technical information and policy guidance, the guidelines also stress that RAs should include a discussion of the strengths and weaknesses of each assessment by describing uncertainties, assumptions, and limitations, as well as the scientific basis and rationale for each assessment (*EPA, 1989a*).

Uncertainty is inherent in many aspects of the RA process. In addition to the use of many conservative assumptions and approximations, the identification and analysis of environmental conditions is difficult and inexact. There are four broad areas where uncertainties may be found in the RA process:

- Collection of site-specific data
- Exposure to receptor populations
- Chemical toxicity
- Risk characterization.

For each of these areas, several factors may increase or decrease the confidence in the accuracy of a RA. Some of these factors, as they may apply to the RA, are discussed below.

4.8.1 Collection of Site-Specific Data

Factors that may introduce uncertainty into analyses of site environmental data are:

- Sample collection methods
- Rationale for placement of sampling stations
- Accurate characterization of geology and hydrogeology
- Representativeness and completeness of data
- Adequacy of data to describe site conditions
- Characterization of exposed or potentially exposed populations
- Analytical methods, detection limits, and quality control/quality assurance procedures.

It was assumed in this evaluation that the sampling activities adequately characterized the nature and distribution of chemicals at the site and that the concentrations used in the BRA represent the chemicals found at the site. The sampling strategy was designed to characterize the nature and extent of the contamination, as necessary, based on the known site history and conditions of other sites in San Francisco studied by HLA.

In an attempt to bracket the potential risks from chemical exposures at the facility, the arithmetic mean and the lower of the 95-percent UCL of the arithmetic mean and the maximum detected concentration were used to characterize average and RME scenarios, respectively. Uncertainties may exist in both of these methods, and risks may be under- or overestimated using these two scenarios, respectively. Through the use of conservative assumptions, the actual risks from exposure to the COCs originating at the site are not likely to exceed risks from the RME case and are, in fact, likely to be much lower than the risks predicted from this evaluation. The discussion of

results based on multipathway exposures from cumulative exposures to a mixture of the COCs is also conservative. The sum of all RME exposures may be an overestimate since not all exposures are expected to occur at once and some exposures may be more typical (average) than others.

4.8.2 Exposure to Receptor Populations

In the exposure evaluation, the primary routes of potential exposure were evaluated, as well as the potential magnitude, duration, and/or frequency of contact. A major source of uncertainty in estimating exposures is the assumption that all individuals within a particular receptor group will receive the same dose. Biological variability in absorption, ingestion rates, breathing rates, frequency, and duration will exist, even in a narrowly defined age group or identified sensitive population group. The evaluated exposure pathways are considered to be the primary pathways of exposure and to represent the majority of the potential health risks from site chemicals and therefore provided conservative results in the BRA.

4.8.3 Chemical Toxicity

As discussed in Appendix D, most toxicity information used in the risk calculations was obtained from animal studies at high doses. Epidemiological studies of specific human populations are available as a source of toxicity information for only some of the COCs. Factors influencing toxicity and, consequently, the evaluation of risk based on animal data are listed below:

- Choice of species, strain, age, and sex of animals
- Number of animals in the study
- Individual variation within animal species

- Similarity in the routes of exposure between the tested species and route of interest in humans
- Purity of test compound
- Decay of test compound
- Selection of dose levels and use of control groups
- Distribution of animals among dose levels
- Similarity between test animals and humans in terms of metabolism and pharmacokinetics
- Proper histopathological examination of animals
- Proper animal husbandry and dietary considerations
- Experimental surroundings
- Selection of proper endpoint in animal studies
- Latency periods
- Synergism or antagonism between chemicals
- Species-to-species extrapolation of dose levels
- High- to low-dose extrapolations and choice of model to describe dose-response curve for carcinogenic chemicals (i.e., all chemicals are assumed to be carcinogenic in the same way)
- Statistical evaluation of confidence intervals and methods used to analyze data.

In the BRA, the HQs and carcinogenic risks were summed without consideration of specific toxic effects and mechanisms of action. The assumption of additivity is most properly applied to compounds that produce the same toxic effect by the same mechanism of action. Thus, the potential for adverse effects and carcinogenic risks may have been overestimated. In addition, even though all chemicals detected at the site were not quantified in the BRA, the COCs provide a representative prediction of potential health risks for evaluating the need for immediate or future remedial action(s).

Any chemical with similar toxic endpoints to COCs may result in risk estimates similar to those presented in the BRA.

In addition, because many of the carcinogenic PNAs lack established toxicity values, the conservative assumption that all carcinogenic PNAs without toxicity values are equipotent to benzo(a)pyrene was made in estimating health risks. However, the results of the analysis for carcinogenic PNAs can also be presented using fractional toxicity equivalent factors (TEFs), which represent fractions of 1.0 assigned to each chemical relative to benzo(a)pyrene, as described in Appendix D. Risk estimates predicted using the assumption of equipotency versus TEFs for carcinogenic PNAs exposures can differ by approximately two orders of magnitude for benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene and three orders of magnitude for benzo(k)fluoranthene and chrysene (Appendix D; *Chu and Chen, 1984*). Therefore, potential cumulative exposures from carcinogenic PNAs may be considerably lower than those estimated in this BRA. The toxicity value used in this assessment for thallium is judged to be conservative. The uncertainty and modifying factors used in deriving the chronic RfD may increase the resulting HQ or HI by approximately one order of magnitude.

4.8.4 Risk Characterization

Integrating site-specific data into the risk characterization step also includes uncertainties. However, conservative assumptions have been employed to minimize the impact of these uncertainties.

Calculations of chemical intake requiring the use of certain intake assumptions can provide considerable uncertainty in a BRA, and are often debated in the scientific community. Intake assumptions include, for example, inhalation rates, dermal contact

rates, ingestion rates, skin surface areas, and absorption factors. The range of uncertainty in the values quoted by various researchers can make a substantial difference in the results of a BRA. The intake assumptions used in this evaluation were obtained from peer-reviewed scientific literature and EPA guidance documents. Uncertainties in the assessments may exist from the use of these assumptions and may result in an overestimation of risk.

The exposure point concentrations used in the BRA were based on current measured concentrations and did not account for changes over time (i.e., reduction in chemical concentration) or physical and chemical properties that influence the biavailability of chemicals (the degree to which a chemical adsorbs to soil and is not available for uptake into the human body via the skin). These factors are not generally accepted in RA guidance. In the absence of these factors, the estimates in the BRA are deemed conservative for dermal exposures.

Additional uncertainties are associated with the averaging times selected for calculating chemical intakes for potential carcinogens and noncarcinogens. The approach to the calculations attempts to average chemical intakes over a period of time to account for the best dose-response relationship given the exposures and chemicals to be evaluated in a BRA.

4.8.5 Summary

Uncertainties are inherent in the risk assessment process. To reduce uncertainties, directly measured concentrations (e.g., soil concentrations) were used to quantify health risks. As indicated in the previous sections, it is expected that uncertainties in this BRA would tend to more overestimate than underestimate health risks. The actual risks from exposure to the COCs originating at the site are not likely

to exceed risks from the RME case and are likely to be much lower than the risks predicted from this evaluation especially if remedial alternatives are planned and implemented for the site.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4–1. Statistical Data Summary for Soil
1009 Mission Street
San Francisco Redevelopment Agency

Parameter	Units	Number of Detects	Number of Analyses	FOD	Minimum Detected Value	Location of Minimum Detection	Depth of Minimum (ft)	Maximum Detected Value	Location of Maximum Detection	Depth of Maximum (ft)	Arithmetic Mean	Standard Deviation of the Arithmetic Mean	95% Upper Confidence Limit of the Arithmetic Mean	Lesser of 95% UCL of Arithmetic Mean and Maximum
PNAs														
Acenaphthylene	mg/kg	0/	7	0.0%	—		—	—		—	—	—	—	—
Acenaphthene	mg/kg	1/	7	14.3%	0.36	B–1	8.50	0.36	B–1	8.50	0.07	0.13	0.32	0.32
Benzo(a)anthracene	mg/kg	2/	7	28.6%	0.07	B–1	2.00	6.67	B–1	8.50	0.98	2.51	5.90	5.90
Benzo(a)pyrene	mg/kg	1/	7	14.3%	6.48	B–1	8.50	6.48	B–1	8.50	0.96	2.44	5.73	5.73
Benzo(g,h,i)perylene	mg/kg	1/	7	14.3%	3.31	B–1	8.50	3.31	B–1	8.50	0.50	1.24	2.93	2.93
Benzo(k)fluoranthene	mg/kg	1/	8	12.5%	8.10	B–1	8.50	8.10	B–1	8.50	1.03	2.88	6.63	6.63
Chrysene	mg/kg	2/	7	28.6%	0.07	B–1	2.00	7.78	B–1	8.50	1.13	2.93	6.88	6.88
Fluoranthene	mg/kg	3/	7	42.9%	0.05	B–2	4.00	11.40	B–1	8.50	1.67	4.29	10.08	10.08
Fluorene	mg/kg	0/	7	0.0%	—		—	—		—	—	—	—	—
Indeno(1,2,3–cd)pyrene	mg/kg	1/	6	16.7%	9.51	B–1	8.50	9.51	B–1	8.50	1.61	3.87	9.20	9.20
Naphthalene	mg/kg	1/	7	14.3%	1.49	B–1	8.50	1.49	B–1	8.50	0.23	0.56	1.32	1.32
Phenanthrene	mg/kg	2/	7	28.6%	0.07	B–1	2.00	6.78	B–1	8.50	0.99	2.56	5.99	5.99
Pyrene	mg/kg	2/	7	28.6%	0.33	B–1	2.00	14.10	B–1	8.50	2.11	5.29	12.48	12.48
TPH														
TPH–Motor Oil	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
OIL & GREASE														
Oil and Grease	mg/kg	4/	6	66.7%	6.00	B–2	1.50	71.00	B–1	8.50	17.00	26.74	69.42	69.42
METALS														
Antimony	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
Arsenic	mg/kg	1/	1	100.0%	50.20	B–2	1.50	50.20	B–2	1.50	50.20	0.00	50.20	50.20
Barium	mg/kg	1/	1	100.0%	224.00	B–2	1.50	224.00	B–2	1.50	224.00	0.00	224.00	224.00
Beryllium	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
Cadmium	mg/kg	1/	1	100.0%	4.10	B–2	1.50	4.10	B–2	1.50	4.10	0.00	4.10	4.10
Chromium	mg/kg	1/	1	100.0%	19.60	B–2	1.50	19.60	B–2	1.50	19.60	0.00	19.60	19.60
Cobalt	mg/kg	1/	1	100.0%	5.70	B–2	1.50	5.70	B–2	1.50	5.70	0.00	5.70	5.70
Copper	mg/kg	1/	1	100.0%	401.00	B–2	1.50	401.00	B–2	1.50	401.00	0.00	401.00	401.00
Lead	mg/kg	6/	6	100.0%	104.00	B–1	2.00	12800.00	B–2	1.50	2906.67	4804.05	12499.00	12499.00
Mercury	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
Molybdenum	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
Nickel	mg/kg	1/	1	100.0%	15.00	B–2	1.50	15.00	B–2	1.50	15.00	0.00	15.00	15.00
Selenium	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
Silver	mg/kg	0/	1	0.0%	—		—	—		—	—	—	—	—
Thallium	mg/kg	1/	1	100.0%	140.00	B–2	1.50	140.00	B–2	1.50	140.00	0.00	140.00	140.00
Vanadium	mg/kg	1/	1	100.0%	23.30	B–2	1.50	23.30	B–2	1.50	23.30	0.00	23.30	23.30
Zinc	mg/kg	1/	1	100.0%	1160.00	B–2	1.50	1160.00	B–2	1.50	1160.00	0.00	1160.00	1160.00

mg/kg = milligrams per kilograms
FOD = Frequency of detection
PNAs = Polynuclear aromatic hydrocarbons

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-2. Screening Analysis of Soils
1009 Mission Street
San Francisco Redevelopment Agency

		Chemical Concentrations		Range of Detection Limits			Agency Standards		
Chemical	Frequency of Detection (Percent)	Maximum Detected (mg/kg)	Arithmetic Mean (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	Background Concentration (mg/kg)	CA AAL (mg/kg)	RCRAn AL (mg/kg)	RCRAc PS min (mg/kg)
Acenaphthene	14.3	3.60E-01	7.00E-02	3.50E-02	3.50E-02	--	NA	NA	NA
Arsenic	100.0	5.02E+01	5.02E+01	1.00E+00	1.00E+00	4.00E+01	NA	8.00E+01	NA
Barium	100.0	2.24E+02	2.24E+02	5.00E-01	5.00E-01	7.00E+02	NA	4.00E+03	NA
Benzo(a)anthracene	28.6	6.67E+00	9.80E-01	3.50E-02	3.50E-02	--	NA	NA	NA
Benzo(a)pyrene	14.3	6.48E+00	9.60E-01	7.00E-02	7.00E-02	--	NA	NA	NA
Benzo(g,h,i)perylene	14.3	3.31E+00	5.00E-01	7.00E-02	7.00E-02	--	NA	NA	NA
Benzo(k)fluoranthene	12.5	8.10E+00	1.03E+00	3.50E-02	3.50E-02	--	NA	NA	NA
Cadmium	100.0	4.10E+00	4.10E+00	1.00E+00	1.00E+00	6.90E+01	NA	4.00E+01	NA
Chromium VI	100.0	1.96E+01	1.96E+01	--	--	2.50E+02	NA	4.00E+02	NA
Chrysene	28.6	7.78E+00	1.13E+00	3.50E-02	3.50E-02	--	NA	NA	NA
Cobalt	100.0	5.70E+00	5.70E+00	--	--	4.00E+01	NA	NA	NA
Copper	100.0	4.01E+02	4.01E+02	--	--	1.00E+02	NA	NA	NA
Fluoranthene	42.9	1.14E+01	1.67E+00	3.50E-02	3.50E-02	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	16.7	9.51E+00	1.61E+00	7.00E-02	7.00E-02	--	NA	NA	NA
Lead	100.0	1.28E+04	2.91E+03	--	--	2.00E+02	NA	NA	NA
Naphthalene	14.3	1.49E+00	2.30E-01	3.50E-02	3.50E-02	--	NA	NA	NA
Nickel	100.0	1.50E+01	1.50E+01	--	--	1.00E+03	NA	2.00E+03	NA
Oil and Grease	66.7	7.10E+01	1.70E+01	4.00E+00	4.00E+00	--	NA	NA	NA
Phenanthrene	28.6	6.78E+00	9.90E-01	3.50E-02	3.50E-02	--	1.00E+02	NA	NA
Pyrene	28.6	1.41E+01	2.11E+00	1.50E-01	1.50E-01	--	NA	NA	NA
Thallium	100.0	1.40E+02	1.40E+02	1.00E+00	1.00E+00	--	NA	6.00E+00	NA
Vanadium	100.0	2.33E+01	2.33E+01	--	--	1.40E+02	NA	7.00E+02	NA
Zinc	100.0	1.16E+03	1.16E+03	--	--	3.00E+02	NA	NA	NA

CA AAL = California Applied Action Level (DTSC, 1992a).
RCRAn AL = Resource Conservation and Recovery Act Noncarcinogenic Action Level (EPA, 1990d).
RCRAc PS min = Resource Conservation and Recovery Act Media Protection Standard for Carcinogens (minimum value).
mg/kg = Milligrams per kilogram.
Note: For risk assessment purposes, values expressed in scientific notation.

**Table 4-3. Intake Assumptions and Computation Methods for Estimating Health-Based Levels (tHBLs) for Construction Workers with Potential Ingestion of Soil, Dermal Contact with Soil, and Inhalation of Dust Exposures
1009 Mission Street
San Francisco Redevelopment Agency**

Adult Construction Worker (30 days)	Abbreviation	Value	Source/Comments
Exposure Duration (years)	ED1	1	EPA, 1991d
Exposure Duration (days/yr)	ED2	30	Assumed exposure period
Inhalation Rate (m^3/day)	InR	20	EPA, 1991d
Respirable Particulate Rate (mg/m^3)	RP	0.51	Cowherd et al., 1974; EPA, 1991d
Pulmonary Absorption Factor	PAF	1	EPA, 1991d
Ingestion Rate (mg/day)	IR	480	Hawley, 1985
Oral Absorption Factor	OAF	1	EPA, 1991d
Dermal Surface Area (cm^2/day)	DSA	5681	50th percentile skin surface area comprising head, hands, legs, arms, feet, EPA, 1990c, 1991c
Soil Adherence Factor (mg/cm^2)	SAF	1	EPA, 1991b
Dermal Absorption Factor	DAF	Chemical Specific	0.01 (metals; EPA, 1989b) 0.03 (VOCs; EPA, 1991b), 0.15 (SOCs; Hawley, 1985)
Body Weight (kg)	BW	70	EPA, 1989a
Averaging Time for Carcinogens (days)	ATc	25550	365 days x 70 years, EPA, 1989a
Averaging Time for Noncarcinogens (days)	ATn	30	30 days x 1 year, EPA, 1989a
Adult Construction Worker (1 year)			
Exposure Duration (years)	ED1	1	EPA, 1991d
Exposure Duration (days/yr)	ED2	250	Assumed exposure period
Inhalation Rate (m^3/day)	InR	20	EPA, 1991d
Respirable Particulate Rate (mg/m^3)	RP	0.51	Cowherd et al., 1974; EPA, 1991d
Pulmonary Absorption Factor	PAF	1	EPA, 1991d
Ingestion Rate (mg/day)	IR	480	Hawley, 1985
Oral Absorption Factor	OAF	1	EPA, 1991d
Dermal Surface Area (cm^2/day)	DSA	5681	50th percentile skin surface area comprising head, hands, legs, arms, feet, EPA, 1990c, 1991c
Soil Adherence Factor (mg/cm^2)	SAF	1	EPA, 1991b
Dermal Absorption Factor	DAF	Chemical Specific	0.01 (metals; EPA, 1989b) 0.03 (VOCs; EPA, 1991b), 0.15 (SOCs; Hawley, 1985)
Body Weight (kg)	BW	70	EPA, 1989a
Averaging Time for Carcinogens (days)	ATc	25550	365 days x 70 years, EPA, 1989a
Averaging Time for Noncarcinogens (days)	ATn	250	30 days x 1 year, EPA, 1989a

Total Health-Based Level for Carcinogens (tHBLc)

$$\text{tHBLc} = \frac{1 \times 10^{-6} \times BW \times ATc}{ED1 \times ED2 \times 10^{-6}\ \text{kg/mg} \times [(ISF \times InR \times RP \times PAF) + (OSF \times IR \times OAF) + (OSF \times DSA \times SAF \times DAF)]}$$

Note: OSF = Oral slope factor from Table 4-5a
ISF = Inhalation slope factor from Table 4-5a
1 x 10^-6 = Assumed target risk of 1 x 10^-6

Total Health-Based Level for Noncarcinogens (tHBLn)

$$\text{tHBLn} = \frac{HQ \times BW \times ATn}{ED1 \times ED2 \times 10^{-6}\ \text{kg/mg} \times \{(IR \times OAF/ORfD) + (DSA \times SAF \times DAF/ORfD) + (InR \times RP \times PAF/IRfD)\}}$$

Note: ORfD = Oral/Dermal Reference Dose from Table 4-5a
IRfD = Inhalation Reference Dose from Table 4-5a
HQ = Assumed target hazard quotient of 1.0

/a/ Methods consistent with EPA, 1989c, 1991i

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4–4. Intake Assumptions and Computation Methods for Estimating Soil Total Health Based Levels (tHBLs) for Residential Children and Adults with Potential Ingestion of Soil, Dermal Contact with Soil, and Inhalation of Dust Exposures 1009 Mission Street San Francisco Redevelopment Agency

Child (0-5 years old)	Abbreviation	Value	Source/Comments
Exposure Duration (years)	ED1	5	EPA, 1990c
Exposure Duration (days/year)	ED2	350	EPA, 1989b
Inhalation Rate (m^3/day)	InR	15	EPA, 1990c
Respirable Particulate Rate (mg/m^3)	RP	0.07	Hawley, 1985
Pulmonary Absorption Factor	PAF	1	EPA, 1991d
Ingestion Rate (mg/day)	IR	200	EPA, 1991c
Oral Absorption Factor	OAF	1	EPA, 1991d
Dermal Surface Area (cm^2/day)	DSA	4288	50th percentile skin surface area comprising head, hands, legs, arms, feet, EPA, 1990c, 1991c
Soil Adherence Factor (mg/cm^2)	SAF	1	EPA, 1991b
Dermal Absorption Factor	DAF	Chemical Specific	0.01 (metals; EPA, 1989b) 0.03 (VOCs; EPA, 1991b), 0.15 (SOCs; Hawley, 1985)
Body Weight (kg)	BW	13	EPA, 1990b
Averaging Time for Carcinogens (days)	ATc	25550	365 days/year x 70 years, EPA, 1989b
Averaging Time for Noncarcinogens (days)	ATn	1825	365 days/year x 5 years, EPA, 1989b
Adult (18–70 years old)			
Exposure Duration (years)	ED1	30	EPA, 1990c
Exposure Duration (days/year)	ED2	350	EPA, 1989b
Inhalation Rate (m^3/day)	InR	15	EPA, 1990c
Respirable Particulate Rate (mg/m^3)	RP	0.07	Hawley, 1985
Pulmonary Absorption Factor	PAF	1	EPA, 1991d
Ingestion Rate (mg/day)	IR	100	EPA, 1991c
Oral Absorption Factor	OAF	1	EPA, 1991d
Dermal Surface Area (cm^2/day)	DSA	5681	50th percentile skin surface area comprising head, hands, legs, arms, feet, EPA, 1990c, 1991c
Soil Adherence Factor (mg/cm^2)	SAF	1	EPA, 1991b
Dermal Absorption Factor	DAF	Chemical Specific	0.01 (metals; EPA, 1989b) 0.03 (VOCs; EPA, 1991b), 0.15 (SOCs; Hawley, 1985)
Body Weight (kg)	BW	70	EPA, 1990b
Averaging Time for Carcinogens (days)	ATc	25550	365 days/year x 70 years, EPA, 1989b
Averaging Time for Noncarcinogens (days)	ATn	10950	365 days/year x 5 years, EPA, 1989b

Total Health-Based Level for Carcinogens (tHBLc)

$$tHBLc = \frac{1 \times 10^{-6} \times BW \times ATc}{ED1 \times ED2 \times 10^{-6}\ \text{kg/mg} \times \{(ISF \times InR \times RP \times PAF) + (OSF \times IR \times OAF) + (OSF \times DSA \times SAF \times DAF)\}}$$

Note: OSF = Oral slope factor from Table 4-5a
ISF = Inhalation slope factor from Table 4-5a
1×10^{-6} = Assumed target risk of 1×10^{-6}

Total Health-Based Level for Noncarcinogens (tHBLn)

$$tHBLn = \frac{HQ \times BW \times ATn}{ED1 \times ED2 \times 10^{-6}\ \text{kg/mg} \times \{(IR \times OAF/ORfD) + (DSA \times DSA \times DAF/ORfD) + (InR \times RP \times PAF/RfD)\}}$$

Note: ORfD = Oral/Dermal Reference Dose from Table 4-5a
IRfD = Inhalation Reference Dose from Table 4-5a

/a/ Methods consistent with EPA, 1989c, 1991i

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-5a. EPA-Established Toxicity Information for COC Selection
1009 Mission Street
San Francisco Redevelopment Agency

	Toxicity Values											
	Inhalation Pathway						Oral Pathway					
Chemical	RfDc (mg/kg/day)	RfDs (mg/kg/day)	Source	SF $(mg/kg/day)^{-1}$	Weight of Evidence	Source	RfDc (mg/kg/day)	RfDs (mg/kg/day)	Source	SF $(mg/kg/day)^{-1}$	Weight of Evidence	Source
Acenaphthene	ND	ND	I91; HA91	DI	NA	I91; HA91	6.00E-02	6.00E-01	I91; HA91	DI	NA	I91; HA91
Arsenic	ND	ND	HA91	5.00E+01	A	I91; HA91	3.00E-04	3.00E-04	HA91	1.75E+00	A	I91; HA91; E88
Barium	1.00E-04	1.00E-03	HA91	NA	NA	I91	7.00E-02	7.00E-02	I91	NA	NA	I91
Benzo(a)anthracene	NA	NA	I91	6.10E+00	B2	I91; HA91	NA	NA	I91	1.15E+01	B2	I91; HA91
Benzo(a)pyrene	NA	NA	I91	6.10E+00	B2	HA91	NA	NA	I91	1.15E+01	B2	HA91
Benzo(g,h,I)perylene	ND	ND	I91; HA91	DI	D	I91; HA91	4.00E-03	4.00E-02	I91; HA91	DI	D	I91; HA91
Benzo(k)fluoranthene	NA	NA	I91	6.10E+00	B2	I91; HA91	NA	NA	I91	1.15E+01	B2	I91; HA91
Cadmium	ND	ND	I91; HA91	6.10E+00	B1	I91; HA91	5.00E-04	ND	I91; HA91	NA	NA	I91; HA91
Chromium VI	5.71E-07	5.71E-06	HA91	4.20E+01	A	I91	5.00E-03	2.00E-02	I91	NA	A	I91
Chrysene	DI	DI	HA91	6.10E+00	B2	I91; HA91	DI	DI	I91	1.15E+01	B2	I91; HA91
Cobalt	NA	NA	I91; HA91	NA	NA	I91; HA91	NA	NA	I91; HA91	NA	NA	I91; HA91
Copper	ND	ND	HA91	DI	D	I91	3.70E-02	3.70E-02	HA91	DI	D	I91
Fluoranthene	ND	ND	I91; HA91	DI	D	I91; HA91	4.00E-02	4.00E-01	I91; HA91	DI	D	I91; HA91
Indeno(1,2,3-cd)pyrene	NA	NA	I91	6.10E+00	B2	I91; HA91	NA	NA	I91	1.15E+01	B2	I91; HA91
Lead	ND	ND	I91	NA	B2	I91	ND	ND	I91	NA	B2	I91
Naphthalene	ND	ND	I91; HA91	DI	D	I91; HA91	4.00E-03	4.00E-02	I91; HA91	DI	D	I91; HA91
Nickel	ND	ND	I91; HA91	8.40E-01	A	I91; HA91	2.00E-02	2.00E-02	I91; HA91	NA	NA	I91; HA91
Oil and Grease	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	ND	ND	I91; HA91	DI	D	I91; HA91	4.00E-03	4.00E-02	I91; HA91	DI	D	I91; HA91
Pyrene	ND	ND	I91; HA91	DI	D	I91; HA91	3.00E-02	3.00E-01	I91; HA91	DI	D	I91; HA91
Thallium	ND	ND	HA91	NA	D	HA91	7.00E-05	7.00E-04	HA91	NA	D	HA91
Vanadium	ND	ND	HA91	NA	NA	NA	7.00E-03	7.00E-03	HA91	NA	NA	NA
Zinc	ND	ND	HA91	DI	D	I91	2.00E-01	2.00E-01	HA91	DI	D	I91

RfDc = Chronic reference dose.
RfDs = Subchronic reference dose.
SF = Slope factor.
mg/kg/day = Milligrams per kilogram per day.
-- = Not applicable.
ND = No data.

I91 = IRIS, 1991.
HA91 = Health Effects Assessment Summary Tables, 1991.
E88 = EPA, 1998.
NA = Not available.
DI = Data inadequate.
Note: For risk assessment purposes, values expressed in scientific notation.

Weight of Evidence definitions as follows:
A = Human carcinogen.
B1/B2 = Probable human carcinogen.
D = Not classified.

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Table 4-5b. EPA- and Other-Established Toxicity Information for Risk Characterization
1009 Mission Street
San Francisco Redevelopment Agency

	Toxicity Values											
	Inhalation Pathway						Oral Pathway					
Chemical	RfDc (mg/kg/day)	RfDs (mg/kg/day)	Source	SF $(mg/kg/day)^{-1}$	Weight of Evidence	Source	RfDc (mg/kg/day)	RfDs (mg/kg/day)	Source	SF $(mg/kg/day)^{-1}$	Weight of Evidence	Source
Arsenic	ND	ND	HA92	1.51E+01	A	I92	3.00E-04	3.00E-04	HA92	1.75E+00	A	SA88
Benzo(a)anthracene	NA	NA	I92	6.10E+00	B2	HA92	NA	NA	I92	5.79E+00	B2	I92; HA92
Benzo(a)pyrene	NA	NA	I92	6.10E+00	B2	HA92	NA	NA	I92	5.79E+00	B2	I92; HA92
Benzo(k)fluoranthene	NA	NA	I92	6.10E+00	B2	HA92	NA	NA	I92	5.79E+00	B2	I92; HA92
Chromium VI	NA	NA	I92; HA92	4.20E+01	A	I92	5.00E-03	2.00E-02	I92	4.20E-01	A	DTSC92
Chrysene	NA	NA	HA92	6.10E+00	B2	HA92	NA	NA	I92	5.79E+00	B2	I92; HA92
Indeno(1,2,3-cd)pyrene	NA	NA	I92	6.10E+00	B2	HA92	NA	NA	I92	5.79E+00	B2	I92; HA92
Lead	NA	NA	I92	NA	B2	I92	NA	NA	I92	NA	B2	I92
Thallium /a/	NA	NA	HA92	NA	D	HA92	7.00E-05	7.00E-04	HA92	NA	D	I92

/a/ Values are as for thallic oxide.

RfDc = Chronic reference dose.
RfDs = Subchronic reference dose.
SF = Slope factor.
mg/kg/day = Milligrams per kilogram per day.
DTSC92 = California Department of Toxic Substances Control, 1992.
I92 = IRIS (EPA,1992a).
HA92 = Health Effects Assessment Summary Tables (EPA, 1992b).
SA88 = Science Advisory Board (EPA, 1988).
NA = Not available.

Weight of Evidence definitions as follows:
A = Human carcinogen.
B1/B2 = Probable human carcinogen.
D = Not classified.

Note: For risk assessment purposes, values expressed in scientific notation.

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Table 4-6. Estimated Health-Based Levels for Residents and Construction Workers
Dermal, Ingestion, and Inhalation Pathways
1009 Mission Street
San Francisco Redevelopment Agency

	Health-Based Levels							
	Residential (mg/kg)				Construction Worker (mg/kg)			
Chemical	tHBLc Child	tHBLc Adult	tHBLn Child	tHBLn Adult	tHBLc 30 Days	tHBLc 1 Year	tHBLn 30 Days	tHBLn 1 Year
Acenaphthene	NA	NA	9.65E+02	4.60E+03	NA	NA	3.15E+04	3.15E+04
Arsenic	3.97E-01	5.21E-01	1.67E+01	1.40E+02	3.04E+01	3.65E+00	3.91E+01	3.91E+01
Barium	NA	NA	9.70E+02	5.73E+03	NA	NA	2.49E+03	2.49E+03
Benzo(a)anthracene	1.96E-02	1.55E-02	NA	NA	3.86E+00	4.63E-01	NA	NA
Benzo(a)pyrene	1.96E-02	1.55E-02	NA	NA	3.86E+00	4.63E-01	NA	NA
Benzo(g,h,i)perylene	NA	NA	6.43E+01	3.07E+02	NA	NA	2.10E+03	2.10E+03
Benzo(k)fluoranthene	1.96E-02	1.55E-02	NA	NA	3.86E+00	4.63E-01	NA	NA
Cadmium	2.96E+01	2.66E+01	2.79E+01	2.33E+02	4.79E+02	5.75E+01	NA	NA
Chromium VI	4.30E+00	3.86E+00	7.18E+00	3.90E+01	6.96E+01	8.35E+00	1.94E+01	1.94E+01
Chrysene	1.96E-02	1.55E-02	NA	NA	3.86E+00	4.63E-01	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	2.07E+03	1.72E+04	NA	NA	4.82E+03	4.82E+03
Fluoranthene	NA	NA	6.43E+02	3.07E+03	NA	NA	2.10E+04	2.10E+04
Indeno(1,2,3-cd)pyrene	1.96E-02	1.55E-02	NA	NA	3.86E+00	4.63E-01	NA	NA
Lead	2.00E+02	2.00E+03	2.00E+02	2.00E+03	1.00E+03	1.00E+03	1.00E+03	1.00E+03
Naphthalene	NA	NA	6.43E+01	3.07E+02	NA	NA	2.10E+03	2.10E+03
Nickel	2.15E+02	1.93E+02	1.12E+03	9.31E+03	3.48E+03	4.17E+02	2.61E+03	2.61E+03
Oil and Grease	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	6.43E+01	3.07E+02	NA	NA	2.10E+03	2.10E+03
Pyrene	NA	NA	4.82E+02	2.30E+03	NA	NA	1.58E+04	1.58E+04
Thallium	NA	NA	3.91E+00	3.26E+01	NA	NA	9.13E+01	9.13E+01
Vanadium	NA	NA	3.91E+02	3.26E+03	NA	NA	9.13E+02	9.13E+02
Zinc	NA	NA	1.12E+04	9.31E+04	NA	NA	2.61E+04	2.61E+04

tHBLc = Total Health-Based Level for carcinogens.
tHBLn = Total Health-Based Level for noncarcinogens.
mg/kg = Milligrams per kilogram.
NA = Not available.
Note: For risk assessment purposes, values expressed in scientific notation.

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Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-7. Potential Chemicals of Concern
1009 Mission Street
San Francisco Redevelopment Agency

				Maximum and/or Mean Concentration in Excess of:											
				Agency Standard			Residential				Construction Worker				
Chemical	>5% FOD	Weight of Evidence is A	Back-ground	CA AAL	RCRA AL	RCRAc PS min	Child tHBLc	Adult tHBLc	Child tHBLn	Adult tHBLn	30 Days tHBLc	1 Year tHBLc	30 Days tHBLn	1 Year tHBLn	Retain as COC
Acenaphthene	Y	N	--	--	--	--	--	--	N	N	--	--	N	N	N
Arsenic	Y	Y	M/A	--	N	--	M/A	M/A	M/A	N	M/A	M/A	M/A	M/A	Y
Barium	Y	N	N	--	N	--	--	--	N	N	--	--	N	N	N
Benzo(a)anthracene	Y	N	--	--	--	--	M/A	M/A	--	--	M	M/A	--	--	Y
Benzo(a)pyrene	Y	N	--	--	--	--	M/A	M/A	--	--	M	M/A	--	--	Y
Benzo(g,h,i)perylene	Y	N	--	--	--	--	--	--	N	N	--	--	N	N	N
Benzo(k)fluoranthene	Y	N	--	--	--	--	M/A	M/A	--	--	M	M/A	--	--	Y
Cadmium	Y	N	N	--	N	--	N	N	N	N	N	N	--	--	N
Chromium VI	Y	Y	N	--	N	--	M/A	M/A	M/A	N	N	M/A	M/A	M/A	Y
Chrysene	Y	N	--	--	--	--	M/A	M/A	--	--	M	M/A	--	--	Y
Cobalt	Y	N	N	--	--	--	--	--	--	--	--	--	--	--	N
Copper	Y	N	M/A	--	--	--	--	--	N	N	--	--	N	N	N
Fluoranthene	Y	N	--	--	--	--	--	--	N	N	--	--	N	N	N
Indeno(1,2,3-cd)pyrene	Y	N	--	--	--	--	M/A	M/A	--	--	M	M/A	--	--	Y
Lead	Y	N	M/A	--	--	--	M/A	M	M/A	M/A	M/A	M/A	M/A	M/A	Y
Naphthalene	Y	N	--	--	--	--	--	--	N	N	--	--	N	N	N
Nickel	Y	Y	N	--	N	--	N	N	N	N	N	N	N	N	N
Oil and Grease	Y	N	--	--	--	--	--	--	--	--	--	--	--	--	N /a/
Phenanthrene	Y	N	--	N	--	--	--	--	N	N	--	--	N	N	N
Pyrene	Y	N	--	--	--	--	--	--	N	N	--	--	N	N	N
Thallium	Y	N	--	--	M/A	--	--	--	M/A	M/A	--	--	M/A	M/A	Y
Vanadium	Y	N	N	--	N	--	--	--	N	N	--	--	N	N	N
Zinc	Y	N	M/A	--	--	--	--	--	N	N	--	--	N	N	N

M = Maximum concentration exceeds screening criteria.
A = Arithmetic mean concentration exceeds screening criteria.
N = Chemical does not exceed screening criteria.
Y = Chemical exceeds screening criteria.
-- = Not calculable:
/a/ See text Section 4.1.3.
Note: For risk assessment purposes, values expressed in scientific notation.

Table 4-8. Exposure Pathways and Receptor Populations Quantified in Risk Characterization
1009 Mission Street
San Francisco, California

	Baseline Pre-Construction Scenario	During Construction Scenario			Post-Construction Scenario
	Hypothetical Resident	Workers		Residents	Hypothetical Resident
Exposure Pathways	Onsite	Onsite Construction	Offsite	Offsite	Onsite
Dermal contact with soil	Table 4-12	Table 4-16	Table 4-19	Table 4-12a	Table 4-12
Ingestion of soil	Table 4-13	Table 4-17	Table 4-20	Table 4-13a	Table 4-13
Ingestion of fruits	--	--	--	Table 4-22	--
Ingestion of vegetables	--	--	--	Table 4-23	--
Inhalation of outdoor dust	Table 4-14	Table 4-18	Table 4-21	Table 4-14a	--
Inhalation of indoor dust	Table 4-15	--	--	--	Table 4-15

Dashes (--) = Exposure pathway not quantified since not applicable to receptor of concern.

Table 4-9. Summary of Exposure Point Concentrations of COCs for Average and Reasonable Maximum Exposures, Pre-Construction Scenario
1009 Mission Street
San Francisco, California

Chemicals of Concern	Soil		Air (Respirable Particulates)			
	Onsite Resident Dermal/Ingestion		Onsite Residents Inhalation			
			Outdoor Air /a/		Indoor Air /b/	
	Average (mg/kg)	RME (mg/kg)	Average (mg/m³)	RME (mg/m³)	Average (mg/m³)	RME (mg/m³)
Arsenic	5.02E+01	5.02E+01	3.51E-06	3.51E-06	2.64E-06	2.64E-06
Benzo(a)anthracene	9.80E-01	5.90E+00	6.86E-08	4.13E-07	5.15E-08	3.10E-07
Benzo(a)pyrene	9.60E-01	5.73E+00	6.72E-08	4.01E-07	5.04E-08	3.01E-07
Benzo(k)fluoranthene	1.03E+00	6.63E+00	7.21E-08	4.64E-07	5.41E-08	3.48E-07
Chromium VI	1.96E+01	1.96E+01	1.37E-06	1.37E-06	1.03E-06	1.03E-06
Chrysene	1.13E+00	6.88E+00	7.91E-08	4.82E-07	5.93E-08	3.61E-07
Indeno(1,2,3-cd)pyrene	1.61E+00	9.20E+00	1.13E-07	6.44E-07	8.45E-08	4.83E-07
Lead	2.91E+03	1.28E+04	2.04E-04	8.96E-04	1.53E-04	6.72E-04
Thallium	1.40E+02	1.40E+02	9.80E-06	9.80E-06	7.35E-06	7.35E-06

5.02E+01 = 5.02×10^1
mg/m³ = milligrams per cubic meters
mg/kg = milligrams per kilograms
Average = arithmetic mean concentration
RME = lesser of maximum and 95% upper confidence limit concentration
SOCs = semivolatile organic compounds
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
/a/ Outdoor air concentrations for residents based on surface soil concentration x 1E-6 kg/mg x RP of 0.07 mg/m³ (Hawley, 1985).
/b/ Indoor air concentrations based on 75% of outdoor air concentrations (Hawley, 1985).

Table 4-10. Summary of Exposure Point Concentrations of COCs for Average and Reasonable Maximum Exposures, During Construction Scenario
1009 Mission Street
San Francisco, California

Chemicals of Concern	Soil				Fruits		Vegetables		Air (Respirable Particulates)			
	Offsite Receptors Dermal/Ingestion		Construction Workers Dermal/Ingestion		Offsite Resident Ingestion		Offsite Resident Ingestion		Construction Workers Inhalation Outdoor Air /b/		Offsite Receptors Inhalation Outdoor Air /b/	
	Average (mg/kg)	RME (mg/kg)	Average (mg/kg)	RME (mg/kg)	Average (mg/kg)	RME (mg/kg)	Average (mg/kg)	RME (mg/kg)	Average (mg/m³)	RME (mg/m³)	Average (mg/m³)	RME (mg/m³)
Arsenic	5.57E-02	5.57E-02	5.02E+01	5.02E+01	5.96E-06	5.96E-06	1.10E-05	1.10E-05	3.58E-05	3.58E-05	1.09E-05	1.09E-05
Benzo(a)anthracene	1.09E-03	6.54E-03	9.80E-01	5.90E+00	6.45E-08	3.88E-07	1.19E-07	7.14E-07	6.99E-07	4.21E-06	2.13E-07	1.28E-06
Benzo(a)pyrene	1.07E-03	6.36E-03	9.60E-01	5.73E+00	3.47E-08	2.07E-07	6.39E-08	3.81E-07	6.84E-07	4.09E-06	2.09E-07	1.25E-06
Benzo(k)fluoranthene	1.14E-03	7.35E-03	1.03E+00	6.63E+00	3.72E-08	2.40E-07	6.85E-08	4.41E-07	7.34E-07	4.73E-06	2.24E-07	1.44E-06
Chromium VI	2.17E-02	2.17E-02	1.96E+01	1.96E+01	4.07E-06	4.07E-06	7.50E-06	7.50E-06	1.40E-05	1.40E-05	4.26E-06	4.26E-06
Chrysene	1.25E-03	7.63E-03	1.13E+00	6.88E+00	7.43E-08	4.52E-07	1.37E-07	8.33E-07	8.06E-07	4.91E-06	2.46E-07	1.50E-06
Indeno(1,2,3-cd)pyrene	1.79E-03	1.02E-02	1.61E+00	9.20E+00	3.24E-08	1.85E-07	5.97E-08	3.41E-07	1.15E-06	6.56E-06	3.50E-07	2.00E-06
Lead	2.15E-01	9.24E-01	2.91E+03	1.28E+04	8.04E-04	3.45E-03	7.15E-04	3.07E-03	2.08E-03	9.15E-03	5.63E-10	2.41E-09
Thallium	1.55E-01	1.55E-01	1.40E+02	1.40E+02	1.67E-06	1.67E-06	3.08E-06	3.08E-06	9.98E-05	9.98E-05	3.04E-05	3.04E-05

5.57E-02 = 5.57 x 10^-2
mg/m³ = milligrams per cubic meters
mg/kg = milligrams per kilograms
Average = arithmetic mean concentration
RME = lesser of maximum and 95% upper confidence limit concentration
SOCs = semivolatile organic compounds
Dashes (--) denote chemical not of concern for receptor and pathway of concern
ND = Not detected
/a/ See Appendices G.
/b/ Outdoor air concentrations for construction workers based on soil concentration x 1E-06 mg/kg x RP of 0.715 mg/m³ (Appendix E); resident/office workers based on soil concentration x 1E-06 kg/mg x RP of 0.07 mg/m³ (Hawley, 1985).

Table 4-11. Summary of Exposure Point Concentrations of COCs for Average and Reasonable Maximum Exposures, Post-Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Chemicals of Concern	Soil Onsite Resident Dermal/Ingestion		Air (Respirable Particulates) Onsite Residents Inhalation Indoor Air /a,b/	
	Average (mg/kg)	RME (mg/kg)	Average (mg/m^3)	RME (mg/m^3)
rsenic	5.02E+00	5.02E+00	2.64E-07	2.64E-07
Benzo(a)anthracene	9.80E-02	5.90E-01	5.15E-09	3.10E-08
Benzo(a)pyrene	9.60E-02	5.73E-01	5.04E-09	3.01E-08
enzo(k)fluoranthene	1.03E-01	6.63E-01	5.41E-09	3.48E-08
hromium VI	1.96E+00	1.96E+00	1.03E-07	1.03E-07
Chrysene	1.13E-01	6.88E-01	5.93E-09	3.61E-08
ndeno(1,2,3-cd)pyrene	1.61E-01	9.20E-01	8.45E-09	4.83E-08
ead	2.91E+02	1.28E+03	1.53E-05	6.72E-05
nallium	1.40E+01	1.40E+01	7.35E-07	7.35E-07

02E+00 = 5.02 x 10^0
g/m^3 = milligrams per cubic meters
mg/kg = milligrams per kilograms
Average = arithmetic mean concentration
ME = lesser of maximum and 95% upper confidence limit concentration
OCs = semivolatile organic compounds
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
ashes (--) denote chemical not of concern for receptor and pathway of concern
D = Not detected
a/ Post-construction scenario exposure point concentrations assumed to be 10% of those in Table 4-9 to account for reduction in exposures from an encapsulated foundation.
/ Indoor air concentrations based on 75% of outdoor air concentrations (Hawley, 1985).

Table 4-12a. Intake Assumptions for Dermal Contact with Soil - Onsite Residents
Pre- and Post-Construction Scenarios
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Child Resident	0 - 5	350	5	1.00E-06	1818	1.00	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 9	350	4	1.00E-06	2204	1.00	24	365	70	365	ED
	Onsite	Future Adult Resident	18 - 27	350	9	1.00E-06	2287	1.00	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Child Resident	0 - 5	350	5	1.00E-06	4288	1.00	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 11	350	6	1.00E-06	6329	1.00	27	365	70	365	ED
	Onsite	Future Child Resident	11 - 18	350	7	1.00E-06	10265	1.00	54	365	70	365	ED
	Onsite	Future Adult Resident	18 - 30	350	12	1.00E-06	5681	1.00	70	365	70	365	ED
	Onsite	Future Adult Resident	18 - 48	350	30	1.00E-06	5681	1.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times DAF \times EF \times ED \times CF \times SA \times AF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ Atn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
DAF - Dermal Absorption Factor assumed to be 0.01 for metals; 0.03 for VOCs; and 0.15 for SOCs; see Table 4-2.

Table 4-12b. Intake Assumptions for Dermal Contact with Soil - Offsite Residents
During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Child Resident	0 - 5	350	5	1.00E-06	1818	1.00	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 9	350	4	1.00E-06	2204	1.00	24	365	70	365	ED
	Offsite	Future Adult Resident	18 - 27	350	9	1.00E-06	2287	1.00	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Child Resident	0 - 5	350	5	1.00E-06	4288	1.00	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 11	350	6	1.00E-06	6329	1.00	27	365	70	365	ED
	Offsite	Future Child Resident	11 - 18	350	7	1.00E-06	10265	1.00	54	365	70	365	ED
	Offsite	Future Adult Resident	18 - 30	350	12	1.00E-06	5681	1.00	70	365	70	365	ED
	Offsite	Future Adult Resident	18 - 48	350	30	1.00E-06	5681	1.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times DAF \times EF \times ED \times CF \times SA \times AF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ Atn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
DAF - Dermal Absorption Factor assumed to be 0.01 for metals; 0.03 for VOCs; and 0.15 for SOCs; see Table 4-2.

Table 4-13a. Intake Assumptions for Ingestion of Soil - Onsite Residents
Pre- and Post-Construction Scenarios
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Child Resident	0 - 5	350	5	200.00	1.00E-06	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 9	350	4	100.00	1.00E-06	24	365	70	365	ED
	Onsite	Future Adult Resident	18 - 27	350	9	100.00	1.00E-06	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Child Resident	0 - 5	350	5	200.00	1.00E-06	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 11	350	6	100.00	1.00E-06	27	365	70	365	ED
	Onsite	Future Child Resident	11 - 18	350	7	100.00	1.00E-06	54	365	70	365	ED
	Onsite	Future Adult Resident	18 - 30	350	12	100.00	1.00E-06	70	365	70	365	ED
	Onsite	Future Adult Resident	18 - 48	350	30	100.00	1.00E-06	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times OAF \times EF \times ED \times IR \times CF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
OAF - Oral Absorption Factor assumed to be equal to 1.

Table 4-13b. Intake Assumptions for Ingestion of Soil - Offsite Residents
During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Child Resident	0 - 5	350	5	200.00	1.00E-06	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 9	350	4	100.00	1.00E-06	24	365	70	365	ED
	Offsite	Future Adult Resident	18 - 27	350	9	100.00	1.00E-06	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Child Resident	0 - 5	350	5	200.00	1.00E-06	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 11	350	6	100.00	1.00E-06	27	365	70	365	ED
	Offsite	Future Child Resident	11 - 18	350	7	100.00	1.00E-06	54	365	70	365	ED
	Offsite	Future Adult Resident	18 - 30	350	12	100.00	1.00E-06	70	365	70	365	ED
	Offsite	Future Adult Resident	18 - 48	350	30	100.00	1.00E-06	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times OAF \times EF \times ED \times IR \times CF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
OAF - Oral Absorption Factor assumed to be equal to 1.

Table 4-14a. Intake Assumptions for Inhalation of Dust in Outdoor Air - Onsite Residents
Pre-Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Child Resident	0 - 5	2.00	350	5	1.24	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 9	2.00	350	4	1.79	24	365	70	365	ED
	Onsite	Future Adult Resident	18 - 27	0.44	350	9	1.40	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Child Resident	0 - 5	2.00	350	5	2.20	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 11	2.00	350	6	3.70	27	365	70	365	ED
	Onsite	Future Child Resident	11 - 18	2.00	350	7	3.70	54	365	70	365	ED
	Onsite	Future Adult Resident	18 - 30	0.44	350	12	3.00	70	365	70	365	ED
	Onsite	Future Adult Resident	18 - 48	0.44	350	30	3.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CA \times PAF \times ET \times EF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CA - Chemical Concentration in Air (mg/m^3);
PAF - Pulmonary Absorption Factor assumed to be 1.

Excerpts from "Site Assessment. 1009 Mission Street. San Francisco. California". Volumes I and II. Harding Lawsons

Table 4-14b. Intake Assumptions for Inhalation of Dust in Outdoor Air - Offsite Residents
During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/ day)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Child Resident	0 - 5	2.00	30	1	1.24	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 9	2.00	30	1	1.79	24	365	70	365	ED
	Offsite	Future Adult Resident	18 - 27	0.44	30	1	1.40	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/ day)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Child Resident	0 - 5	2.00	350	1	2.20	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 11	2.00	350	1	3.70	27	365	70	365	ED
	Offsite	Future Child Resident	11 - 18	2.00	350	1	3.70	54	365	70	365	ED
	Offsite	Future Adult Resident	18 - 30	0.44	350	1	3.00	70	365	70	365	ED
	Offsite	Future Adult Resident	18 - 48	0.44	350	1	3.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CA \times PAF \times ET \times EF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CA - Chemical Concentration in Air (mg/m^3);
PAF - Pulmonary Absorption Factor assumed to be 1.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-15. Intake Assumptions for Inhalation of Dust in Indoor Air - Onsite Residents
Pre- and Post-Construction Scenarios
San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Child Resident	0 - 5	16.40	350	5	0.66	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 9	16.40	350	4	0.81	24	365	70	365	ED
	Onsite	Future Adult Resident	18 - 27	16.40	350	9	0.63	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Child Resident	0 - 5	16.40	350	5	0.90	13	365	70	365	ED
	Onsite	Future Child Resident	5 - 11	16.40	350	6	1.23	27	365	70	365	ED
	Onsite	Future Child Resident	11 - 18	16.40	350	7	1.24	54	365	70	365	ED
	Onsite	Future Adult Resident	18 - 30	16.40	350	12	0.89	70	365	70	365	ED
	Onsite	Future Adult Resident	18 - 48	16.40	350	30	0.89	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CA \times PAF \times ET \times EF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CA - Chemical Concentration in Air (mg/m^3);
PAF - Pulmonary Absorption Factor assumed to be 1.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-16. Intake Assumptions for Dermal Contact with Soil - Onsite Construction Workers During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Adult Worker-Const	18 - 65	30	1	1.00E-06	2287	1.00	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Adult Worker-Const	18 - 65	250	1	1.00E-06	5681	1.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times DAF \times EF \times ED \times CF \times SA \times AF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age group assigned is based on the receptor population expected for the exposure scenario.
/c/ Atn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
DAF - Dermal Absorption Factors assumed to be 0.01 for metals; 0.03 for VOCs; and 0.15 for SOCs; see Table 4-2.

Table 4-17. Intake Assumptions for Ingestion of Soil - Onsite Construction Workers During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Adult Worker-Const	18 - 65	30	1	480.00	1.00E-06	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Adult Worker-Const	18 - 65	250	1	480.00	1.00E-06	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times OAF \times EF \times ED \times IR \times CF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age group assigned is based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
OAF - Oral Absorption Factor assumed to be equal to 1.

Table 4-18. Intake Assumptions for Inhalation of Dust from Outdoor Air - Onsite Construction Workers During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Onsite	Future Adult Worker-Const	18 - 65	8.00	30	1	1.40	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Onsite	Future Adult Worker-Const	18 - 65	8.00	250	1	3.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CA \times PAF \times ET \times EF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age group assigned is based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CA - Chemical Concentration in Air (mg/m^3);
PAF - Pulmonary Absorption Factor assumed to be equal to 1.

Table 4-19. Intake Assumptions for Dermal Contact with Soil - Offsite Workers - During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Adult Worker	18 - 27	250	9	1.00E-06	2287	1.00	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	CF Conversion Factor (kg/mg)	SA Skin Surface Area (cm^2)	AF Adherence Factor (mg/cm^2)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Adult Worker	18 - 43	250	25	1.00E-06	5681	1.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times DAF \times EF \times ED \times CF \times SA \times AF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ Atn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
DAF - Dermal Absorption Factor assumed to be 0.01 for metals; 0.03 for VOCs; and 0.15 for SOCs; see Table 4-2.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-20. Intake Assumptions for Ingestion of Soil - Offsite Workers - During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Adult Worker	18 - 27	250	9	50.00	1.00E-06	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	EF Exposure Frequency (days/ year)	ED Exposure Duration (years/ lifetime)	IR Ingestion Rate (mg/day)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Adult Worker	18 - 43	250	25	50.00	1.00E-06	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CS \times OAF \times EF \times ED \times IR \times CF}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CS - Chemical Concentration in Soil (mg/kg);
OAF - Oral Absorption Factor assumed to be equal to 1.

Table 4-21. Intake Assumptions for Inhalation of Dust from Outdoor Air - Offsite Workers During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Adult Worker	18 - 27	8.00	30	1	1.40	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	ET Exposure Time (hours/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years/lifetime)	IR Inhalation Rate (m^3/hour)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Adult Worker	18 - 43	8.00	250	1	3.00	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CA \times PAF \times ET \times EF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CA - Chemical Concentration In Air (mg/m^3);
PAF - Pulmonary Absorption Factor assumed to be equal to 1.

Table 4-22. Intake Assumptions for Ingestion of Local/Homegrown Fruits - Offsite Residents During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	FI Fraction Ingested (unitless)	EF Exposure Frequency (days/year)	SF Seasonal Factor (unitless)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (kg/day)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Child Resident	0 - 5	0.20	350	0.20	5	0.14	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 9	0.20	350	0.20	4	0.15	24	365	70	365	ED
	Offsite	Future Adult Resident	18 - 27	0.20	350	0.20	9	0.12	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	FI Fraction Ingested (unitless)	EF Exposure Frequency (days/year)	SF Seasonal Factor (unitless)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (kg/day)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Child Resident	0 - 5	0.30	350	0.50	5	0.14	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 11	0.30	350	0.50	6	0.15	27	365	70	365	ED
	Offsite	Future Child Resident	11 - 18	0.30	350	0.50	7	0.14	54	365	70	365	ED
	Offsite	Future Adult Resident	18 - 30	0.30	350	0.50	12	0.12	70	365	70	365	ED
	Offsite	Future Adult Resident	18 - 48	0.30	350	0.50	30	0.13	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CF \times OAF \times FI \times EF \times SF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CF - Chemical Concentration in Fruit (mg/kg);
OAF - Oral Absorption Factor assumed to be 1.

Table 4-23. Intake Assumptions for Ingestion of Local/Homegrown Vegetables - Offsite Residents During Construction Scenario
1009 Mission Street - San Francisco Redevelopment Agency /a/

Scenario	Location	Receptor Population	Age /b/ (years)	FI Fraction Ingested (unitless)	EF Exposure Frequency (days/year)	SF Seasonal Factor (unitless)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (kg/day)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
AVERAGE SCENARIO	Offsite	Future Child Resident	0 - 5	0.25	350	0.20	5	0.10	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 9	0.25	350	0.20	4	0.14	24	365	70	365	ED
	Offsite	Future Adult Resident	18 - 27	0.25	350	0.20	9	0.20	70	365	70	365	ED

Scenario	Location	Receptor Population	Age /b/ (years)	FI Fraction Ingested (unitless)	EF Exposure Frequency (days/year)	SF Seasonal Factor (unitless)	ED Exposure Duration (years/lifetime)	IR Ingestion Rate (kg/day)	BW Body Weight (kg)	ATc Carcinogenic AVERAGING TIME (days)	ATc Carcinogenic AVERAGING TIME (years)	ATn /c/ Noncarcinogenic AVERAGING TIME (days)	ATn /c/ Noncarcinogenic AVERAGING TIME (years)
REASONABLE MAXIMUM SCENARIO	Offsite	Future Child Resident	0 - 5	0.40	350	0.50	5	0.10	13	365	70	365	ED
	Offsite	Future Child Resident	5 - 11	0.40	350	0.50	6	0.15	27	365	70	365	ED
	Offsite	Future Child Resident	11 - 18	0.40	350	0.50	7	0.18	54	365	70	365	ED
	Offsite	Future Adult Resident	18 - 30	0.40	350	0.50	12	0.20	70	365	70	365	ED
	Offsite	Future Adult Resident	18 - 48	0.40	350	0.50	30	0.23	70	365	70	365	ED

Equation /d/

$$CDI = \frac{CF \times OAF \times FI \times EF \times SF \times ED \times IR}{BW \times AT}$$

/a/ See text for explanation.
/b/ The age groups assigned are based on the receptor population expected for the exposure scenario.
/c/ ATn (years) is equivalent to ED value in all cases.
/d/ CDI - Chronic Daily Intake (mg/kg/day);
CF - Chemical Concentration in Vegetables (mg/kg);
OAF - Oral Absorption Factor assumed to be 1.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-24. Summary of Risks from Multipathway Exposures, Pre-Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Receptor Populations Exposure Pathways	Hazard Index		Potential Upperbound Excess Cancer Risk	
	Average	RME	Average	RME
Child/Adult Residents				
Dermal Contact with Soil	2.91E+00	6.87E+00	8.64E-05	2.26E-03
Ingestion of Soil	3.20E+01	3.20E+01	1.66E-04	5.23E-04
Inhalation of Dust from Outdoor Air	N/A	N/A	2.40E-06	7.75E-06
Inhalation of Dust from Indoor Air	N/A	N/A	7.42E-06	1.97E-05
Multipathway Exposures	3E+01	4E+01	3E-04	3E-03
Adult Residents				
Dermal Contact with Soil	6.81E-01	1.69E+00	2.38E-05	1.03E-03
Ingestion of Soil	2.97E+00	2.97E+00	2.28E-05	1.73E-04
Inhalation of Dust from Outdoor Air	N/A	N/A	1.23E-07	9.71E-07
Inhalation of Dust from Indoor Air	N/A	N/A	1.55E-06	8.07E-06
Multipathway Exposures	4E+00	5E+00	5E-05	1E-03

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-25. Summary of Risks from Multipathway Exposures, During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Receptor Populations Exposure Pathways	Hazard Index		Potential Upperbound Excess Cancer Risk	
	Average	RME	Average	RME
Construction Workers				
Dermal Contact with Soil	9.89E-03	2.05E-01	2.27E-07	2.44E-05
Ingestion of Soil	2.08E-01	1.73E+00	1.04E-06	1.98E-05
Inhalation of Dust from Outdoor Air	N/A	N/A	2.17E-07	4.28E-06
Multipathway Exposures	2E-01	2E+00	1E-06	5E-05
Adult Office Workers				
Dermal Contact with Soil	5.38E-04	1.34E-03	1.89E-08	6.79E-07
Ingestion of Soil	1.17E-03	1.17E-03	9.01E-09	5.69E-08
Inhalation of Dust from Outdoor Air	N/A	N/A	6.59E-08	1.30E-06
Multipathway Exposures	2E-03	3E-03	9E-08	2E-06
Child/Adult Residents				
Dermal Contact with Soil	3.22E-03	7.60E-03	9.60E-08	2.51E-06
Ingestion of Soil	6.07E-03	3.55E-02	1.84E-07	5.80E-07
Ingestion of Local/Homegrown Fruits	1.84E-05	6.91E-05	5.85E-10	5.35E-09
Ingestion of Local/Homegrown Vegetables	3.03E-05	1.21E-04	1.06E-09	1.35E-08
Inhalation of Dust from Outdoor Air	N/A	N/A	1.40E-07	4.09E-06
Multipathway Exposures	9E-03	4E-02	4E-07	7E-06
Adult Residents				
Dermal Contact with Soil	7.54E-04	1.87E-03	2.65E-08	1.14E-06
Ingestion of Soil	5.63E-04	3.29E-03	2.53E-08	1.92E-07
Ingestion of Local/Homegrown Fruits	2.93E-06	1.19E-05	1.14E-10	2.36E-09
Ingestion of Local/Homegrown Vegetables	1.13E-05	5.17E-05	4.40E-10	1.03E-08
Inhalation of Dust from Outdoor Air	N/A	N/A	3.63E-09	1.00E-07
Multipathway Exposures	1E-03	5E-03	6E-08	1E-06

Table 4-26. Summary of Risks from Multipathway Exposures, Post-Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Receptor Populations Exposure Pathways	Hazard Index		Potential Upperbound Excess Cancer Risk	
	Average	RME	Average	RME
Child/Adult Residents				
Dermal Contact with Soil	2.91E-01	6.87E-01	8.64E-06	2.26E-04
Ingestion of Soil	3.20E+00	3.20E+00	1.66E-05	5.23E-05
Inhalation of Dust from Indoor Air	N/A	N/A	7.42E-07	1.97E-06
Multipathway Exposures	3E+00	4E+00	3E-05	3E-04
Adult Residents				
Dermal Contact with Soil	6.81E-02	1.69E-01	2.38E-06	1.03E-04
Ingestion of Soil	2.97E-01	2.97E-01	2.28E-06	1.73E-05
Inhalation of Dust from Indoor Air	N/A	N/A	1.55E-07	8.07E-07
Multipathway Exposures	4E-01	5E-01	5E-06	1E-04

Table 4-27. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Onsite Residents Pre-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	5.02E+01	6.73E-05	2.24E-01	4.81E-06	N/A
	Onsite	Child Resident	5- 9	5.02E+01	4.42E-05	1.47E-01	2.53E-06	N/A
	Onsite	Child Resident	0- 9	5.02E+01	N/A	N/A	7.33E-06	1.28E-05
	Onsite	Adult Resident	18-27	5.02E+01	1.57E-05	5.24E-02	2.02E-06	3.54E-06
Benzo(a)anthracene	Onsite	Child Resident	0- 5	9.80E-01	1.97E-05	--	1.41E-06	N/A
	Onsite	Child Resident	5- 9	9.80E-01	1.29E-05	--	7.40E-07	N/A
	Onsite	Child Resident	0- 9	9.80E-01	N/A	N/A	2.15E-06	1.24E-05
	Onsite	Adult Resident	18-27	9.80E-01	4.61E-06	--	5.92E-07	3.43E-06
Benzo(a)pyrene	Onsite	Child Resident	0- 5	9.60E-01	1.93E-05	--	1.38E-06	N/A
	Onsite	Child Resident	5- 9	9.60E-01	1.27E-05	--	7.25E-07	N/A
	Onsite	Child Resident	0- 9	9.60E-01	N/A	N/A	2.10E-06	1.22E-05
	Onsite	Adult Resident	18-27	9.60E-01	4.51E-06	--	5.80E-07	3.36E-06
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	1.03E+00	2.07E-05	--	1.48E-06	N/A
	Onsite	Child Resident	5- 9	1.03E+00	1.36E-05	--	7.77E-07	N/A
	Onsite	Child Resident	0- 9	1.03E+00	N/A	N/A	2.26E-06	1.31E-05
	Onsite	Adult Resident	18-27	1.03E+00	4.84E-06	--	6.22E-07	3.60E-06
Chromium VI	Onsite	Child Resident	0- 5	1.96E+01	2.63E-05	5.26E-03	1.88E-06	N/A
	Onsite	Child Resident	5- 9	1.96E+01	1.73E-05	3.45E-03	9.86E-07	N/A
	Onsite	Child Resident	0- 9	1.96E+01	N/A	N/A	2.86E-06	1.20E-06
	Onsite	Adult Resident	18-27	1.96E+01	6.14E-06	1.23E-03	7.89E-07	3.32E-07
Chrysene	Onsite	Child Resident	0- 5	1.13E+00	2.27E-05	--	1.62E-06	N/A
	Onsite	Child Resident	5- 9	1.13E+00	1.49E-05	--	8.53E-07	N/A
	Onsite	Child Resident	0- 9	1.13E+00	N/A	N/A	2.48E-06	1.43E-05
	Onsite	Adult Resident	18-27	1.13E+00	5.31E-06	--	6.83E-07	3.95E-06
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	1.61E+00	3.24E-05	--	2.31E-06	N/A
	Onsite	Child Resident	5- 9	1.61E+00	2.13E-05	--	1.22E-06	N/A
	Onsite	Child Resident	0- 9	1.61E+00	N/A	N/A	3.53E-06	2.04E-05
	Onsite	Adult Resident	18-27	1.61E+00	7.57E-06	--	9.73E-07	5.63E-06
Thallium	Onsite	Child Resident	0- 5	1.40E+02	1.88E-04	2.68E+00	1.34E-05	N/A
	Onsite	Child Resident	5- 9	1.40E+02	1.23E-04	1.76E+00	7.04E-06	N/A
	Onsite	Child Resident	0- 9	1.40E+02	N/A	N/A	2.05E-05	--
	Onsite	Adult Resident	18-27	1.40E+02	4.39E-05	6.27E-01	5.64E-06	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for dermal contact pathway and soil concentrations presented in Tables 4-9 and 4-12.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-27. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Onsite Residents Pre-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	2.91E+00	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	1.91E+00	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	8.64E-05
	Onsite	Adult Resident	18-27	N/A	N/A	6.81E-01	N/A	2.38E-05

Table 4-27. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Onsite Residents Pre-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
				REASONABLE MAXIMUM SCENARIO				
Arsenic	Onsite	Child Resident	0- 5	5.02E+01	1.59E-04	5.29E-01	1.13E-05	N/A
	Onsite	Child Resident	5-11	5.02E+01	1.13E-04	3.76E-01	9.67E-06	N/A
	Onsite	Child Resident	11-18	5.02E+01	9.15E-05	3.05E-01	9.15E-06	N/A
	Onsite	Adult Resident	18-30	5.02E+01	3.91E-05	1.30E-01	6.70E-06	N/A
	Onsite	Adult Resident	0-30	5.02E+01	N/A	N/A	3.69E-05	6.45E-05
	Onsite	Adult Resident	18-48	5.02E+01	3.91E-05	1.30E-01	1.67E-05	2.93E-05
Benzo(a)anthracene	Onsite	Child Resident	0- 5	5.90E+00	2.80E-04	--	2.00E-05	N/A
	Onsite	Child Resident	5-11	5.90E+00	1.99E-04	--	1.71E-05	N/A
	Onsite	Child Resident	11-18	5.90E+00	1.61E-04	--	1.61E-05	N/A
	Onsite	Adult Resident	18-30	5.90E+00	6.89E-05	--	1.18E-05	N/A
	Onsite	Adult Resident	0-30	5.90E+00	N/A	N/A	6.50E-05	3.76E-04
	Onsite	Adult Resident	18-48	5.90E+00	6.89E-05	--	2.95E-05	1.71E-04
Benzo(a)pyrene	Onsite	Child Resident	0- 5	5.73E+00	2.72E-04	--	1.94E-05	N/A
	Onsite	Child Resident	5-11	5.73E+00	1.93E-04	--	1.66E-05	N/A
	Onsite	Child Resident	11-18	5.73E+00	1.57E-04	--	1.57E-05	N/A
	Onsite	Adult Resident	18-30	5.73E+00	6.69E-05	--	1.15E-05	N/A
	Onsite	Adult Resident	0-30	5.73E+00	N/A	N/A	6.31E-05	3.65E-04
	Onsite	Adult Resident	18-48	5.73E+00	6.69E-05	--	2.87E-05	1.66E-04
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	6.63E+00	3.15E-04	--	2.25E-05	N/A
	Onsite	Child Resident	5-11	6.63E+00	2.24E-04	--	1.92E-05	N/A
	Onsite	Child Resident	11-18	6.63E+00	1.81E-04	--	1.81E-05	N/A
	Onsite	Adult Resident	18-30	6.63E+00	7.74E-05	--	1.33E-05	N/A
	Onsite	Adult Resident	0-30	6.63E+00	N/A	N/A	7.30E-05	4.23E-04
	Onsite	Adult Resident	18-48	6.63E+00	7.74E-05	--	3.32E-05	1.92E-04
Chromium VI	Onsite	Child Resident	0- 5	1.96E+01	6.20E-05	1.24E-02	4.43E-06	N/A
	Onsite	Child Resident	5-11	1.96E+01	4.41E-05	8.81E-03	3.78E-06	N/A
	Onsite	Child Resident	11-18	1.96E+01	3.57E-05	7.15E-03	3.57E-06	N/A
	Onsite	Adult Resident	18-30	1.96E+01	1.53E-05	3.05E-03	2.61E-06	N/A
	Onsite	Adult Resident	0-30	1.96E+01	N/A	N/A	1.44E-05	6.04E-06
	Onsite	Adult Resident	18-48	1.96E+01	1.53E-05	3.05E-03	6.54E-06	2.75E-06
Chrysene	Onsite	Child Resident	0- 5	6.88E+00	3.26E-04	--	2.33E-05	N/A
	Onsite	Child Resident	5-11	6.88E+00	2.32E-04	--	1.99E-05	N/A
	Onsite	Child Resident	11-18	6.88E+00	1.88E-04	--	1.88E-05	N/A
	Onsite	Adult Resident	18-30	6.88E+00	8.03E-05	--	1.38E-05	N/A
	Onsite	Adult Resident	0-30	6.88E+00	N/A	N/A	7.58E-05	4.39E-04
	Onsite	Adult Resident	18-48	6.88E+00	8.03E-05	--	3.44E-05	1.99E-04
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	9.20E+00	4.36E-04	--	3.12E-05	N/A
	Onsite	Child Resident	5-11	9.20E+00	3.10E-04	--	2.66E-05	N/A
	Onsite	Child Resident	11-18	9.20E+00	2.52E-04	--	2.52E-05	N/A
	Onsite	Adult Resident	18-30	9.20E+00	1.07E-04	--	1.84E-05	N/A
	Onsite	Adult Resident	0-30	9.20E+00	N/A	N/A	1.01E-04	5.87E-04
	Onsite	Adult Resident	18-48	9.20E+00	1.07E-04	--	4.60E-05	2.66E-04

Table 4-27. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Onsite Residents Pre-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Onsite	Child Resident	0- 5	1.40E+02	4.43E-04	6.33E+00	3.16E-05	N/A
	Onsite	Child Resident	5-11	1.40E+02	3.15E-04	4.50E+00	2.70E-05	N/A
	Onsite	Child Resident	11-18	1.40E+02	2.55E-04	3.65E+00	2.55E-05	N/A
	Onsite	Adult Resident	18-30	1.40E+02	1.09E-04	1.56E+00	1.87E-05	N/A
	Onsite	Adult Resident	0-30	1.40E+02	N/A	N/A	1.03E-04	--
	Onsite	Adult Resident	18-48	1.40E+02	1.09E-04	1.56E+00	4.67E-05	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	6.87E+00	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	4.88E+00	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	3.96E+00	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	1.69E+00	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	2.26E-03
	Onsite	Adult Resident	18-48	N/A	N/A	1.69E+00	N/A	1.03E-03

Table 4-28. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Onsite Residents, Pre-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	5.02E+01	7.41E-04	2.47E+00	5.29E-05	N/A
	Onsite	Child Resident	5- 9	5.02E+01	2.01E-04	6.69E-01	1.15E-05	N/A
	Onsite	Child Resident	0- 9	5.02E+01	N/A	N/A	6.44E-05	1.13E-04
	Onsite	Adult Resident	18-27	5.02E+01	6.88E-05	2.29E-01	8.84E-06	1.55E-05
Benzo(a)anthracene	Onsite	Child Resident	0- 5	9.80E-01	1.45E-05	--	1.03E-06	N/A
	Onsite	Child Resident	5- 9	9.80E-01	3.92E-06	--	2.24E-07	N/A
	Onsite	Child Resident	0- 9	9.80E-01	N/A	N/A	1.26E-06	7.27E-06
	Onsite	Adult Resident	18-27	9.80E-01	1.34E-06	--	1.73E-07	9.99E-07
Benzo(a)pyrene	Onsite	Child Resident	0- 5	9.60E-01	1.42E-05	--	1.01E-06	N/A
	Onsite	Child Resident	5- 9	9.60E-01	3.84E-06	--	2.19E-07	N/A
	Onsite	Child Resident	0- 9	9.60E-01	N/A	N/A	1.23E-06	7.13E-06
	Onsite	Adult Resident	18-27	9.60E-01	1.32E-06	--	1.69E-07	9.79E-07
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	1.03E+00	1.52E-05	--	1.09E-06	N/A
	Onsite	Child Resident	5- 9	1.03E+00	4.12E-06	--	2.35E-07	N/A
	Onsite	Child Resident	0- 9	1.03E+00	N/A	N/A	1.32E-06	7.65E-06
	Onsite	Adult Resident	18-27	1.03E+00	1.41E-06	--	1.81E-07	1.05E-06
Chromium VI	Onsite	Child Resident	0- 5	1.96E+01	2.89E-04	5.78E-02	2.07E-05	N/A
	Onsite	Child Resident	5- 9	1.96E+01	7.83E-05	1.57E-02	4.47E-06	N/A
	Onsite	Child Resident	0- 9	1.96E+01	N/A	N/A	2.51E-05	1.06E-05
	Onsite	Adult Resident	18-27	1.96E+01	2.68E-05	5.37E-03	3.45E-06	1.45E-06
Chrysene	Onsite	Child Resident	0- 5	1.13E+00	1.67E-05	--	1.19E-06	N/A
	Onsite	Child Resident	5- 9	1.13E+00	4.51E-06	--	2.58E-07	N/A
	Onsite	Child Resident	0- 9	1.13E+00	N/A	N/A	1.45E-06	8.39E-06
	Onsite	Adult Resident	18-27	1.13E+00	1.55E-06	--	1.99E-07	1.15E-06
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	1.61E+00	2.38E-05	--	1.70E-06	N/A
	Onsite	Child Resident	5- 9	1.61E+00	6.43E-06	--	3.68E-07	N/A
	Onsite	Child Resident	0- 9	1.61E+00	N/A	N/A	2.06E-06	1.20E-05
	Onsite	Adult Resident	18-27	1.61E+00	2.21E-06	--	2.84E-07	1.64E-06
Thallium	Onsite	Child Resident	0- 5	1.40E+02	2.07E-03	2.95E+01	1.48E-04	N/A
	Onsite	Child Resident	5- 9	1.40E+02	5.59E-04	7.99E+00	3.20E-05	N/A
	Onsite	Child Resident	0- 9	1.40E+02	N/A	N/A	1.79E-04	--
	Onsite	Adult Resident	18-27	1.40E+02	1.92E-04	2.74E+00	2.47E-05	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for ingestion pathway and soil concentrations presented in Tables 4-9 and 4-13.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-28. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Onsite Residents, Pre-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	3.20E+01	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	8.67E+00	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	1.66E-04
	Onsite	Adult Resident	18-27	N/A	N/A	2.97E+00	N/A	2.28E-05

Table 4-28. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Onsite Residents, Pre-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	5.02E+01	7.41E-04	2.47E+00	5.29E-05	N/A
	Onsite	Child Resident	5-11	5.02E+01	1.78E-04	5.94E-01	1.53E-05	N/A
	Onsite	Child Resident	11-18	5.02E+01	8.91E-05	2.97E-01	8.91E-06	N/A
	Onsite	Adult Resident	18-30	5.02E+01	6.88E-05	2.29E-01	1.18E-05	N/A
	Onsite	Adult Resident	0-30	5.02E+01	N/A	N/A	8.89E-05	1.56E-04
	Onsite	Adult Resident	18-48	5.02E+01	6.88E-05	2.29E-01	2.95E-05	5.16E-05
Benzo(a)anthracene	Onsite	Child Resident	0- 5	5.90E+00	8.70E-05	--	6.22E-06	N/A
	Onsite	Child Resident	5-11	5.90E+00	2.10E-05	--	1.80E-06	N/A
	Onsite	Child Resident	11-18	5.90E+00	1.05E-05	--	1.05E-06	N/A
	Onsite	Adult Resident	18-30	5.90E+00	8.08E-06	--	1.39E-06	N/A
	Onsite	Adult Resident	0-30	5.90E+00	N/A	N/A	1.04E-05	6.05E-05
	Onsite	Adult Resident	18-48	5.90E+00	8.08E-06	--	3.46E-06	2.01E-05
Benzo(a)pyrene	Onsite	Child Resident	0- 5	5.73E+00	8.45E-05	--	6.04E-06	N/A
	Onsite	Child Resident	5-11	5.73E+00	2.04E-05	--	1.74E-06	N/A
	Onsite	Child Resident	11-18	5.73E+00	1.02E-05	--	1.02E-06	N/A
	Onsite	Adult Resident	18-30	5.73E+00	7.85E-06	--	1.35E-06	N/A
	Onsite	Adult Resident	0-30	5.73E+00	N/A	N/A	1.01E-05	5.87E-05
	Onsite	Adult Resident	18-48	5.73E+00	7.85E-06	--	3.36E-06	1.95E-05
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	6.63E+00	9.78E-05	--	6.99E-06	N/A
	Onsite	Child Resident	5-11	6.63E+00	2.35E-05	--	2.02E-06	N/A
	Onsite	Child Resident	11-18	6.63E+00	1.18E-05	--	1.18E-06	N/A
	Onsite	Adult Resident	18-30	6.63E+00	9.08E-06	--	1.56E-06	N/A
	Onsite	Adult Resident	0-30	6.63E+00	N/A	N/A	1.17E-05	6.80E-05
	Onsite	Adult Resident	18-48	6.63E+00	9.08E-06	--	3.89E-06	2.25E-05
Chromium VI	Onsite	Child Resident	0- 5	1.96E+01	2.89E-04	5.78E-02	2.07E-05	N/A
	Onsite	Child Resident	5-11	1.96E+01	6.96E-05	1.39E-02	5.97E-06	N/A
	Onsite	Child Resident	11-18	1.96E+01	3.48E-05	6.96E-03	3.48E-06	N/A
	Onsite	Adult Resident	18-30	1.96E+01	2.68E-05	5.37E-03	4.60E-06	N/A
	Onsite	Adult Resident	0-30	1.96E+01	N/A	N/A	3.47E-05	1.46E-05
	Onsite	Adult Resident	18-48	1.96E+01	2.68E-05	5.37E-03	1.15E-05	4.83E-06
Chrysene	Onsite	Child Resident	0- 5	6.88E+00	1.01E-04	--	7.25E-06	N/A
	Onsite	Child Resident	5-11	6.88E+00	2.44E-05	--	2.09E-06	N/A
	Onsite	Child Resident	11-18	6.88E+00	1.22E-05	--	1.22E-06	N/A
	Onsite	Adult Resident	18-30	6.88E+00	9.42E-06	--	1.62E-06	N/A
	Onsite	Adult Resident	0-30	6.88E+00	N/A	N/A	1.22E-05	7.05E-05
	Onsite	Adult Resident	18-48	6.88E+00	9.42E-06	--	4.04E-06	2.34E-05
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	9.20E+00	1.36E-04	--	9.69E-06	N/A
	Onsite	Child Resident	5-11	9.20E+00	3.27E-05	--	2.80E-06	N/A
	Onsite	Child Resident	11-18	9.20E+00	1.63E-05	--	1.63E-06	N/A
	Onsite	Adult Resident	18-30	9.20E+00	1.26E-05	--	2.16E-06	N/A
	Onsite	Adult Resident	0-30	9.20E+00	N/A	N/A	1.63E-05	9.43E-05
	Onsite	Adult Resident	18-48	9.20E+00	1.26E-05	--	5.40E-06	3.13E-05

Table 4-28. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Onsite Residents, Pre-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Thallium	Onsite	Child Resident	0- 5	1.40E+02	2.07E-03	2.95E+01	1.48E-04	N/A
	Onsite	Child Resident	5-11	1.40E+02	4.97E-04	7.10E+00	4.26E-05	N/A
	Onsite	Child Resident	11-18	1.40E+02	2.49E-04	3.55E+00	2.49E-05	N/A
	Onsite	Adult Resident	18-30	1.40E+02	1.92E-04	2.74E+00	3.29E-05	N/A
	Onsite	Adult Resident	0-30	1.40E+02	N/A	N/A	2.48E-04	--
	Onsite	Adult Resident	18-48	1.40E+02	1.92E-04	2.74E+00	8.22E-05	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	3.20E+01	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	7.71E+00	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	3.85E+00	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	2.97E+00	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	5.23E-04
	Onsite	Adult Resident	18-48	N/A	N/A	2.97E+00	N/A	1.73E-04

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-29. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Outdoor Air - Onsite Residents Pre-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	3.51E-06	6.42E-07	--	4.59E-08	N/A
	Onsite	Child Resident	5- 9	3.51E-06	5.02E-07	--	2.87E-08	N/A
	Onsite	Child Resident	0- 9	3.51E-06	N/A	N/A	7.46E-08	1.13E-06
	Onsite	Adult Resident	18-27	3.51E-06	2.96E-08	--	3.81E-09	5.75E-08
Benzo(a)anthracene	Onsite	Child Resident	0- 5	6.86E-08	.1.25E-08	--	8.96E-10	N/A
	Onsite	Child Resident	5- 9	6.86E-08	9.81E-09	--	5.61E-10	N/A
	Onsite	Child Resident	0- 9	6.86E-08	N/A	N/A	1.46E-09	8.89E-09
	Onsite	Adult Resident	18-27	6.86E-08	5.79E-10	--	7.44E-11	4.54E-10
Benzo(a)pyrene	Onsite	Child Resident	0- 5	6.72E-08	1.23E-08	--	8.78E-10	N/A
	Onsite	Child Resident	5- 9	6.72E-08	9.61E-09	--	5.49E-10	N/A
	Onsite	Child Resident	0- 9	6.72E-08	N/A	N/A	1.43E-09	8.71E-09
	Onsite	Adult Resident	18-27	6.72E-08	5.67E-10	--	7.29E-11	4.45E-10
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	7.21E-08	1.32E-08	--	9.42E-10	N/A
	Onsite	Child Resident	5- 9	7.21E-08	1.03E-08	--	5.89E-10	N/A
	Onsite	Child Resident	0- 9	7.21E-08	N/A	N/A	1.53E-09	9.34E-09
	Onsite	Adult Resident	18-27	7.21E-08	6.08E-10	--	7.82E-11	4.77E-10
Chromium VI	Onsite	Child Resident	0- 5	1.37E-06	2.51E-07	--	1.79E-08	N/A
	Onsite	Child Resident	5- 9	1.37E-06	1.96E-07	--	1.12E-08	N/A
	Onsite	Child Resident	0- 9	1.37E-06	N/A	N/A	2.91E-08	1.22E-06
	Onsite	Adult Resident	18-27	1.37E-06	1.16E-08	--	1.49E-09	6.24E-08
Chrysene	Onsite	Child Resident	0- 5	7.91E-08	1.45E-08	--	1.03E-09	N/A
	Onsite	Child Resident	5- 9	7.91E-08	1.13E-08	--	6.46E-10	N/A
	Onsite	Child Resident	0- 9	7.91E-08	N/A	N/A	1.68E-09	1.02E-08
	Onsite	Adult Resident	18-27	7.91E-08	6.67E-10	--	8.58E-11	5.23E-10
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	1.13E-07	2.07E-08	--	1.48E-09	N/A
	Onsite	Child Resident	5- 9	1.13E-07	1.62E-08	--	9.24E-10	N/A
	Onsite	Child Resident	0- 9	1.13E-07	N/A	N/A	2.40E-09	1.46E-08
	Onsite	Adult Resident	18-27	1.13E-07	9.54E-10	--	1.22E-10	7.48E-10
Thallium	Onsite	Child Resident	0- 5	9.80E-06	1.79E-06	--	1.28E-07	N/A
	Onsite	Child Resident	5- 9	9.80E-06	1.40E-06	--	8.01E-08	N/A
	Onsite	Child Resident	0- 9	9.80E-06	N/A	N/A	2.08E-07	--
	Onsite	Adult Resident	18-27	9.80E-06	8.27E-08	--	1.06E-08	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for inhalation of dust pathway and air concentrations presented in Tables 4-9 and 4-14.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.

Notes:

N/A = Not applicable

Dashes (--) = Not calculable

Table 4-29. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Outdoor Air - Onsite Residents Pre-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	2.40E-06
	Onsite	Adult Resident	18-27	N/A	N/A	--	N/A	1.23E-07

Table 4-29. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Outdoor Air - Onsite Residents Pre-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	3.51E-06	1.14E-06	--	8.14E-08	N/A
	Onsite	Child Resident	5-11	3.51E-06	9.22E-07	--	7.91E-08	N/A
	Onsite	Child Resident	11-18	3.51E-06	4.61E-07	--	4.61E-08	N/A
	Onsite	Adult Resident	18-30	3.51E-06	6.35E-08	--	1.09E-08	N/A
	Onsite	Adult Resident	0-30	3.51E-06	N/A	N/A	2.17E-07	3.28E-06
	Onsite	Adult Resident	18-48	3.51E-06	6.35E-08	--	2.72E-08	4.11E-07
Benzo(a)anthracene	Onsite	Child Resident	0- 5	4.13E-07	1.34E-07	--	9.57E-09	N/A
	Onsite	Child Resident	5-11	4.13E-07	1.09E-07	--	9.30E-09	N/A
	Onsite	Child Resident	11-18	4.13E-07	5.43E-08	--	5.43E-09	N/A
	Onsite	Adult Resident	18-30	4.13E-07	7.47E-09	--	1.28E-09	N/A
	Onsite	Adult Resident	0-30	4.13E-07	N/A	N/A	2.56E-08	1.56E-07
	Onsite	Adult Resident	18-48	4.13E-07	7.47E-09	--	3.20E-09	1.95E-08
Benzo(a)pyrene	Onsite	Child Resident	0- 5	4.01E-07	1.30E-07	--	9.30E-09	N/A
	Onsite	Child Resident	5-11	4.01E-07	1.05E-07	--	9.03E-09	N/A
	Onsite	Child Resident	11-18	4.01E-07	5.27E-08	--	5.27E-09	N/A
	Onsite	Adult Resident	18-30	4.01E-07	7.25E-09	--	1.24E-09	N/A
	Onsite	Adult Resident	0-30	4.01E-07	N/A	N/A	2.48E-08	1.52E-07
	Onsite	Adult Resident	18-48	4.01E-07	7.25E-09	--	3.11E-09	1.90E-08
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	4.64E-07	1.51E-07	--	1.08E-08	N/A
	Onsite	Child Resident	5-11	4.64E-07	1.22E-07	--	1.05E-08	N/A
	Onsite	Child Resident	11-18	4.64E-07	6.10E-08	--	6.10E-09	N/A
	Onsite	Adult Resident	18-30	4.64E-07	8.39E-09	--	1.44E-09	N/A
	Onsite	Adult Resident	0-30	4.64E-07	N/A	N/A	2.87E-08	1.75E-07
	Onsite	Adult Resident	18-48	4.64E-07	8.39E-09	--	3.60E-09	2.19E-08
Chromium VI	Onsite	Child Resident	0- 5	1.37E-06	4.45E-07	--	3.18E-08	N/A
	Onsite	Child Resident	5-11	1.37E-06	3.60E-07	--	3.09E-08	N/A
	Onsite	Child Resident	11-18	1.37E-06	1.80E-07	--	1.80E-08	N/A
	Onsite	Adult Resident	18-30	1.37E-06	2.48E-08	--	4.25E-09	N/A
	Onsite	Adult Resident	0-30	1.37E-06	N/A	N/A	8.49E-08	3.56E-06
	Onsite	Adult Resident	18-48	1.37E-06	2.48E-08	--	1.06E-08	4.46E-07
Chrysene	Onsite	Child Resident	0- 5	4.82E-07	1.56E-07	--	1.12E-08	N/A
	Onsite	Child Resident	5-11	4.82E-07	1.27E-07	--	1.09E-08	N/A
	Onsite	Child Resident	11-18	4.82E-07	6.33E-08	--	6.33E-09	N/A
	Onsite	Adult Resident	18-30	4.82E-07	8.72E-09	--	1.49E-09	N/A
	Onsite	Adult Resident	0-30	4.82E-07	N/A	N/A	2.99E-08	1.82E-07
	Onsite	Adult Resident	18-48	4.82E-07	8.72E-09	--	3.74E-09	2.28E-08
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	6.44E-07	2.09E-07	--	1.49E-08	N/A
	Onsite	Child Resident	5-11	6.44E-07	1.69E-07	--	1.45E-08	N/A
	Onsite	Child Resident	11-18	6.44E-07	8.46E-08	--	8.46E-09	N/A
	Onsite	Adult Resident	18-30	6.44E-07	1.16E-08	--	2.00E-09	N/A
	Onsite	Adult Resident	0-30	6.44E-07	N/A	N/A	3.99E-08	2.43E-07
	Onsite	Adult Resident	18-48	6.44E-07	1.16E-08	--	4.99E-09	3.04E-08

Table 4-29. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Outdoor Air - Onsite Residents Pre-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Onsite	Child Resident	0- 5	9.80E-06	3.18E-06	--	2.27E-07	N/A
	Onsite	Child Resident	5-11	9.80E-06	2.58E-06	--	2.21E-07	N/A
	Onsite	Child Resident	11-18	9.80E-06	1.29E-06	--	1.29E-07	N/A
	Onsite	Adult Resident	18-30	9.80E-06	1.77E-07	--	3.04E-08	N/A
	Onsite	Adult Resident	0-30	9.80E-06	N/A	N/A	6.07E-07	--
	Onsite	Adult Resident	18-48	9.80E-06	1.77E-07	--	7.59E-08	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	--	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	--	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	7.75E-06
	Onsite	Adult Resident	18-48	N/A	N/A	--	N/A	9.71E-07

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-30. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Onsite Residents Pre-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	2.64E-06	2.11E-06	--	1.51E-07	N/A
	Onsite	Child Resident	5- 9	2.64E-06	1.40E-06	--	8.01E-08	N/A
	Onsite	Child Resident	0- 9	2.64E-06	N/A	N/A	2.31E-07	3.48E-06
	Onsite	Adult Resident	18-27	2.64E-06	3.74E-07	--	4.80E-08	7.25E-07
Benzo(a)anthracene	Onsite	Child Resident	0- 5	5.15E-08	4.11E-08	--	2.94E-09	N/A
	Onsite	Child Resident	5- 9	5.15E-08	2.73E-08	--	1.56E-09	N/A
	Onsite	Child Resident	0- 9	5.15E-08	N/A	N/A	4.50E-09	2.74E-08
	Onsite	Adult Resident	18-27	5.15E-08	7.29E-09	--	9.37E-10	5.72E-09
Benzo(a)pyrene	Onsite	Child Resident	0- 5	5.04E-08	4.02E-08	--	2.87E-09	N/A
	Onsite	Child Resident	5- 9	5.04E-08	2.67E-08	--	1.53E-09	N/A
	Onsite	Child Resident	0- 9	5.04E-08	N/A	N/A	4.40E-09	2.69E-08
	Onsite	Adult Resident	18-27	5.04E-08	7.13E-09	--	9.17E-10	5.59E-09
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	5.41E-08	4.32E-08	--	3.09E-09	N/A
	Onsite	Child Resident	5- 9	5.41E-08	2.87E-08	--	1.64E-09	N/A
	Onsite	Child Resident	0- 9	5.41E-08	N/A	N/A	4.73E-09	2.88E-08
	Onsite	Adult Resident	18-27	5.41E-08	7.66E-09	--	9.84E-10	6.01E-09
Chromium VI	Onsite	Child Resident	0- 5	1.03E-06	8.22E-07	--	5.87E-08	N/A
	Onsite	Child Resident	5- 9	1.03E-06	5.47E-07	--	3.12E-08	N/A
	Onsite	Child Resident	0- 9	1.03E-06	N/A	N/A	9.00E-08	3.78E-06
	Onsite	Adult Resident	18-27	1.03E-06	1.46E-07	--	1.87E-08	7.87E-07
Chrysene	Onsite	Child Resident	0- 5	5.93E-08	4.73E-08	--	3.38E-09	N/A
	Onsite	Child Resident	5- 9	5.93E-08	3.15E-08	--	1.80E-09	N/A
	Onsite	Child Resident	0- 9	5.93E-08	N/A	N/A	5.18E-09	3.16E-08
	Onsite	Adult Resident	18-27	5.93E-08	8.39E-09	--	1.08E-09	6.58E-09
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	8.45E-08	6.75E-08	--	4.82E-09	N/A
	Onsite	Child Resident	5- 9	8.45E-08	4.48E-08	--	2.56E-09	N/A
	Onsite	Child Resident	0- 9	8.45E-08	N/A	N/A	7.38E-09	4.50E-08
	Onsite	Adult Resident	18-27	8.45E-08	1.20E-08	--	1.54E-09	9.38E-09
Thallium	Onsite	Child Resident	0- 5	7.35E-06	5.87E-06	--	4.19E-07	N/A
	Onsite	Child Resident	5- 9	7.35E-06	3.90E-06	--	2.23E-07	N/A
	Onsite	Child Resident	0- 9	7.35E-06	N/A	N/A	6.42E-07	--
	Onsite	Adult Resident	18-27	7.35E-06	1.04E-06	--	1.34E-07	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for inhalation of dust pathway and air concentrations presented in Tables 4-9 and 4-15.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-30. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Onsite Residents Pre-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	7.42E-06
	Onsite	Adult Resident	18-27	N/A	N/A	--	N/A	1.55E-06

Table 4-30. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Onsite Residents Pre-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	2.64E-06	2.87E-06	--	2.05E-07	N/A
	Onsite	Child Resident	5-11	2.64E-06	1.89E-06	--	1.62E-07	N/A
	Onsite	Child Resident	11-18	2.64E-06	9.53E-07	--	9.53E-08	N/A
	Onsite	Adult Resident	18-30	2.64E-06	5.28E-07	--	9.05E-08	N/A
	Onsite	Adult Resident	0-30	2.64E-06	N/A	N/A	5.53E-07	8.35E-06
	Onsite	Adult Resident	18-48	2.64E-06	5.28E-07	--	2.26E-07	3.42E-06
Benzo(a)anthracene	Onsite	Child Resident	0- 5	3.10E-07	3.38E-07	--	2.41E-08	N/A
	Onsite	Child Resident	5-11	3.10E-07	2.22E-07	--	1.90E-08	N/A
	Onsite	Child Resident	11-18	3.10E-07	1.12E-07	--	1.12E-08	N/A
	Onsite	Adult Resident	18-30	3.10E-07	6.20E-08	--	1.06E-08	N/A
	Onsite	Adult Resident	0-30	3.10E-07	N/A	N/A	6.50E-08	3.96E-07
	Onsite	Adult Resident	18-48	3.10E-07	6.20E-08	--	2.66E-08	1.62E-07
Benzo(a)pyrene	Onsite	Child Resident	0- 5	3.01E-07	3.28E-07	--	2.34E-08	N/A
	Onsite	Child Resident	5-11	3.01E-07	2.16E-07	--	1.85E-08	N/A
	Onsite	Child Resident	11-18	3.01E-07	1.09E-07	--	1.09E-08	N/A
	Onsite	Adult Resident	18-30	3.01E-07	6.02E-08	--	1.03E-08	N/A
	Onsite	Adult Resident	0-30	3.01E-07	N/A	N/A	6.31E-08	3.85E-07
	Onsite	Adult Resident	18-48	3.01E-07	6.02E-08	--	2.58E-08	1.57E-07
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	3.48E-07	3.79E-07	--	2.71E-08	N/A
	Onsite	Child Resident	5-11	3.48E-07	2.49E-07	--	2.14E-08	N/A
	Onsite	Child Resident	11-18	3.48E-07	1.26E-07	--	1.26E-08	N/A
	Onsite	Adult Resident	18-30	3.48E-07	6.96E-08	--	1.19E-08	N/A
	Onsite	Adult Resident	0-30	3.48E-07	N/A	N/A	7.29E-08	4.45E-07
	Onsite	Adult Resident	18-48	3.48E-07	6.96E-08	--	2.98E-08	1.82E-07
Chromium VI	Onsite	Child Resident	0- 5	1.03E-06	1.12E-06	--	8.01E-08	N/A
	Onsite	Child Resident	5-11	1.03E-06	7.38E-07	--	6.32E-08	N/A
	Onsite	Child Resident	11-18	1.03E-06	3.72E-07	--	3.72E-08	N/A
	Onsite	Adult Resident	18-30	1.03E-06	2.06E-07	--	3.53E-08	N/A
	Onsite	Adult Resident	0-30	1.03E-06	N/A	N/A	2.16E-07	9.07E-06
	Onsite	Adult Resident	18-48	1.03E-06	2.06E-07	--	8.83E-08	3.71E-06
Chrysene	Onsite	Child Resident	0- 5	3.61E-07	3.93E-07	--	2.81E-08	N/A
	Onsite	Child Resident	5-11	3.61E-07	2.59E-07	--	2.22E-08	N/A
	Onsite	Child Resident	11-18	3.61E-07	1.30E-07	--	1.30E-08	N/A
	Onsite	Adult Resident	18-30	3.61E-07	7.22E-08	--	1.24E-08	N/A
	Onsite	Adult Resident	0-30	3.61E-07	N/A	N/A	7.57E-08	4.61E-07
	Onsite	Adult Resident	18-48	3.61E-07	7.22E-08	--	3.09E-08	1.89E-07
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	4.83E-07	5.26E-07	--	3.76E-08	N/A
	Onsite	Child Resident	5-11	4.83E-07	3.46E-07	--	2.97E-08	N/A
	Onsite	Child Resident	11-18	4.83E-07	1.74E-07	--	1.74E-08	N/A
	Onsite	Adult Resident	18-30	4.83E-07	9.66E-08	--	1.66E-08	N/A
	Onsite	Adult Resident	0-30	4.83E-07	N/A	N/A	1.01E-07	6.17E-07
	Onsite	Adult Resident	18-48	4.83E-07	9.66E-08	--	4.14E-08	2.52E-07

Table 4-30. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Onsite Residents Pre-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Onsite	Child Resident	0- 5	7.35E-06	8.00E-06	--	5.72E-07	N/A
	Onsite	Child Resident	5-11	7.35E-06	5.27E-06	--	4.51E-07	N/A
	Onsite	Child Resident	11-18	7.35E-06	2.65E-06	--	2.65E-07	N/A
	Onsite	Adult Resident	18-30	7.35E-06	1.47E-06	--	2.52E-07	N/A
	Onsite	Adult Resident	0-30	7.35E-06	N/A	N/A	1.54E-06	--
	Onsite	Adult Resident	18-48	7.35E-06	1.47E-06	--	6.30E-07	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	--	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	--	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	1.97E-05
	Onsite	Adult Resident	18-48	N/A	N/A	--	N/A	8.07E-06

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-31. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Onsite Construction Workers During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/kg)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Adult Worker-Const.	18-65	5.02E+01	1.35E-06	4.49E-03	1.93E-08	3.37E-08
Benzo(a)anthracene	Onsite	Adult Worker-Const.	18-65	9.80E-01	3.95E-07	--	5.64E-09	3.27E-08
Benzo(a)pyrene	Onsite	Adult Worker-Const.	18-65	9.60E-01	3.87E-07	--	5.52E-09	3.20E-08
Benzo(k)fluoranthene	Onsite	Adult Worker-Const.	18-65	1.03E+00	4.15E-07	--	5.93E-09	3.43E-08
Chromium VI	Onsite	Adult Worker-Const.	18-65	1.96E+01	5.26E-07	2.63E-05	7.52E-09	3.16E-09
Chrysene	Onsite	Adult Worker-Const.	18-65	1.13E+00	4.55E-07	--	6.50E-09	3.76E-08
Indeno(1,2,3-cd)pyrene	Onsite	Adult Worker-Const.	18-65	1.61E+00	6.49E-07	--	9.26E-09	5.36E-08
Thallium	Onsite	Adult Worker-Const.	18-65	1.40E+02	3.76E-06	5.37E-03	5.37E-08	--
Sum Total	Onsite	Adult Worker-Const.	18-65	N/A	N/A	9.89E-03	N/A	2.27E-07

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic subchronic and chronic daily intake (SDIn, CDIc) dose calculated based on intake assumptions for dermal contact pathway and soil concentrations presented in Tables 4-10 and 4-16.
/c/ HQ = Hazard Quotient (Dose/sRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-31. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Onsite Construction Workers During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Adult Worker-Const.	18-65	5.02E+01	2.79E-05	9.30E-02	3.99E-07	6.98E-07
Benzo(a)anthracene	Onsite	Adult Worker-Const.	18-65	5.90E+00	4.92E-05	--	7.03E-07	4.07E-06
Benzo(a)pyrene	Onsite	Adult Worker-Const.	18-65	5.73E+00	4.78E-05	--	6.83E-07	3.95E-06
Benzo(k)fluoranthene	Onsite	Adult Worker-Const.	18-65	6.63E+00	5.53E-05	--	7.90E-07	4.57E-06
Chromium VI	Onsite	Adult Worker-Const.	18-65	1.96E+01	1.09E-05	5.45E-04	1.56E-07	6.54E-08
Chrysene	Onsite	Adult Worker-Const.	18-65	6.88E+00	5.74E-05	--	8.20E-07	4.74E-06
Indeno(1,2,3-cd)pyrene	Onsite	Adult Worker-Const.	18-65	9.20E+00	7.67E-05	--	1.10E-06	6.35E-06
Thallium	Onsite	Adult Worker-Const.	18-65	1.40E+02	7.78E-05	1.11E-01	1.11E-06	--
Sum Total	Onsite	Adult Worker-Const.	18-65	N/A	N/A	2.05E-01	N/A	2.44E-05

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-32. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Onsite Construction Workers During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Adult Worker-Const.	18-65	5.02E+01	2.83E-05	9.43E-02	4.04E-07	7.07E-07
Benzo(a)anthracene	Onsite	Adult Worker-Const.	18-65	9.80E-01	5.52E-07	--	7.89E-09	4.57E-08
Benzo(a)pyrene	Onsite	Adult Worker-Const.	18-65	9.60E-01	5.41E-07	--	7.73E-09	4.48E-08
Benzo(k)fluoranthene	Onsite	Adult Worker-Const.	18-65	1.03E+00	5.81E-07	--	8.29E-09	4.80E-08
Chromium VI	Onsite	Adult Worker-Const.	18-65	1.96E+01	1.10E-05	5.52E-04	1.58E-07	6.63E-08
Chrysene	Onsite	Adult Worker-Const.	18-65	1.13E+00	6.37E-07	--	9.10E-09	5.27E-08
Indeno(1,2,3-cd)pyrene	Onsite	Adult Worker-Const.	18-65	1.61E+00	9.07E-07	--	1.30E-08	7.51E-08
Thallium	Onsite	Adult Worker-Const.	18-65	1.40E+02	7.89E-05	1.13E-01	1.13E-06	--
Sum Total	Onsite	Adult Worker-Const.	18-65	N/A	N/A	2.08E-01	N/A	1.04E-06

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic subchronic and chronic daily intake (SDIn, CDIc) dose calculated based on intake assumptions for ingestion pathway and soil concentrations presented in Tables 4-10 and 4-17.
/c/ HQ = Hazard Quotient (Dose/sRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-32. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Onsite Construction Workers During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Adult Worker-Const.	18-65	5.02E+01	2.36E-04	7.86E-01	3.37E-06	5.89E-06
Benzo(a)anthracene	Onsite	Adult Worker-Const.	18-65	5.90E+00	2.77E-05	--	3.96E-07	2.29E-06
Benzo(a)pyrene	Onsite	Adult Worker-Const.	18-65	5.73E+00	2.69E-05	--	3.84E-07	2.23E-06
Benzo(k)fluoranthene	Onsite	Adult Worker-Const.	18-65	6.63E+00	3.11E-05	--	4.45E-07	2.58E-06
Chromium VI	Onsite	Adult Worker-Const.	18-65	1.96E+01	9.21E-05	4.60E-03	1.32E-06	5.52E-07
Chrysene	Onsite	Adult Worker-Const.	18-65	6.88E+00	3.23E-05	--	4.62E-07	2.67E-06
Indeno(1,2,3-cd)pyrene	Onsite	Adult Worker-Const.	18-65	9.20E+00	4.32E-05	--	6.17E-07	3.57E-06
Thallium	Onsite	Adult Worker-Const.	18-65	1.40E+02	6.58E-04	9.39E-01	9.39E-06	--
Sum Total	Onsite	Adult Worker-Const.	18-65	N/A	N/A	1.73E+00	N/A	1.98E-05

Table 4-33. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust from Outdoor Air - Onsite Construction Workers During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Adult Worker-Const.	18-65	3.58E-05	4.71E-07	--	6.73E-09	1.02E-07
Benzo(a)anthracene	Onsite	Adult Worker-Const.	18-65	6.99E-07	9.19E-09	--	1.31E-10	8.01E-10
Benzo(a)pyrene	Onsite	Adult Worker-Const.	18-65	6.84E-07	9.00E-09	--	1.28E-10	7.84E-10
Benzo(k)fluoranthene	Onsite	Adult Worker-Const.	18-65	7.34E-07	9.65E-09	--	1.38E-10	8.41E-10
Chromium VI	Onsite	Adult Worker-Const.	18-65	1.40E-05	1.84E-07	--	2.63E-09	1.10E-07
Chrysene	Onsite	Adult Worker-Const.	18-65	8.06E-07	1.06E-08	--	1.51E-10	9.24E-10
Indeno(1,2,3-cd)pyrene	Onsite	Adult Worker-Const.	18-65	1.15E-06	1.51E-08	--	2.16E-10	1.32E-09
Thallium	Onsite	Adult Worker-Const.	18-65	9.98E-05	1.31E-06	--	1.87E-08	--
Sum Total	Onsite	Adult Worker-Const.	18-65	N/A	N/A	--	N/A	2.17E-07

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic subchronic and chronic daily intake (SDIn, CDIc) dose calculated based on intake assumptions for inhalation of dusts pathway and air concentrations presented in Tables 4-10 and 4-18.
/c/ HQ = Hazard Quotient (Dose/sRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-33. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust from Outdoor Air - Onsite Construction Workers During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Adult Worker-Const.	18-65	3.58E-05	8.41E-06	--	1.20E-07	1.81E-06
Benzo(a)anthracene	Onsite	Adult Worker-Const.	18-65	4.21E-06	9.89E-07	--	1.41E-08	8.62E-08
Benzo(a)pyrene	Onsite	Adult Worker-Const.	18-65	4.09E-06	9.60E-07	--	1.37E-08	8.37E-08
Benzo(k)fluoranthene	Onsite	Adult Worker-Const.	18-65	4.73E-06	1.11E-06	--	1.59E-08	9.68E-08
Chromium VI	Onsite	Adult Worker-Const.	18-65	1.40E-05	3.29E-06	--	4.70E-08	1.97E-06
Chrysene	Onsite	Adult Worker-Const.	18-65	4.91E-06	1.15E-06	--	1.65E-08	1.00E-07
Indeno(1,2,3-cd)pyrene	Onsite	Adult Worker-Const.	18-65	6.56E-06	1.54E-06	--	2.20E-08	1.34E-07
Thallium	Onsite	Adult Worker-Const.	18-65	9.98E-05	2.34E-05	--	3.35E-07	--
Sum Total	Onsite	Adult Worker-Const.	18-65	N/A	N/A	--	N/A	4.28E-06

Table 4-34. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Offsite Workers During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Adult Worker	18-27	5.57E-02	1.25E-08	4.15E-05	1.60E-09	2.80E-09
Benzo(a)anthracene	Offsite	Adult Worker	18-27	1.09E-03	3.66E-09	--	4.70E-10	2.72E-09
Benzo(a)pyrene	Offsite	Adult Worker	18-27	1.07E-03	3.59E-09	--	4.62E-10	2.67E-09
Benzo(k)fluoranthene	Offsite	Adult Worker	18-27	1.14E-03	3.83E-09	--	4.92E-10	2.85E-09
Chromium VI	Offsite	Adult Worker	18-27	2.17E-02	4.86E-09	9.71E-07	6.24E-10	2.62E-10
Chrysene	Offsite	Adult Worker	18-27	1.25E-03	4.20E-09	--	5.39E-10	3.12E-09
Indeno(1,2,3-cd)pyrene	Offsite	Adult Worker	18-27	1.79E-03	6.01E-09	--	7.72E-10	4.47E-09
Thallium	Offsite	Adult Worker	18-27	1.55E-01	3.47E-08	4.96E-04	4.46E-09	--
Sum Total	Offsite	Adult Worker	18-27	N/A	N/A	5.38E-04	N/A	1.89E-08

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for dermal contact pathway and soil concentrations presented in Tables 4-10 and 4-19.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-34. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Offsite Workers During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Adult Worker	18-43	5.57E-02	3.10E-08	1.03E-04	1.11E-08	1.94E-08
Benzo(a)anthracene	Offsite	Adult Worker	18-43	6.54E-03	5.45E-08	--	1.95E-08	1.13E-07
Benzo(a)pyrene	Offsite	Adult Worker	18-43	6.36E-03	5.30E-08	--	1.89E-08	1.10E-07
Benzo(k)fluoranthene	Offsite	Adult Worker	18-43	7.35E-03	6.13E-08	--	2.19E-08	1.27E-07
Chromium VI	Offsite	Adult Worker	18-43	2.17E-02	1.21E-08	2.41E-06	4.31E-09	1.81E-09
Chrysene	Offsite	Adult Worker	18-43	7.63E-03	6.36E-08	--	2.27E-08	1.32E-07
Indeno(1,2,3-cd)pyrene	Offsite	Adult Worker	18-43	1.02E-02	8.50E-08	--	3.04E-08	1.76E-07
Thallium	Offsite	Adult Worker	18-43	1.55E-01	8.62E-08	1.23E-03	3.08E-08	--
Sum Total	Offsite	Adult Worker	18-43	N/A	N/A	1.34E-03	N/A	6.79E-07

Table 4-35. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Offsite Workers During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Adult Worker	18-27	5.57E-02	2.73E-08	9.08E-05	3.50E-09	6.13E-09
Benzo(a)anthracene	Offsite	Adult Worker	18-27	1.09E-03	5.33E-10	--	6.85E-11	3.97E-10
Benzo(a)pyrene	Offsite	Adult Worker	18-27	1.07E-03	5.23E-10	--	6.73E-11	3.90E-10
Benzo(k)fluoranthene	Offsite	Adult Worker	18-27	1.14E-03	5.58E-10	--	7.17E-11	4.15E-10
Chromium VI	Offsite	Adult Worker	18-27	2.17E-02	1.06E-08	2.12E-06	1.36E-09	5.73E-10
Chrysene	Offsite	Adult Worker	18-27	1.25E-03	6.12E-10	--	7.86E-11	4.55E-10
Indeno(1,2,3-cd)pyrene	Offsite	Adult Worker	18-27	1.79E-03	8.76E-10	--	1.12E-10	6.52E-10
Thallium	Offsite	Adult Worker	18-27	1.55E-01	7.58E-08	1.08E-03	9.75E-09	--
Sum Total	Offsite	Adult Worker	18-27	N/A	N/A	1.17E-03	N/A	9.01E-09

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for ingestion pathway and soil concentrations presented in Tables 4-10 and 4-20.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-35. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Offsite Workers During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Adult Worker	18-43	5.57E-02	2.73E-08	9.08E-05	9.73E-09	1.70E-08
Benzo(a)anthracene	Offsite	Adult Worker	18-43	6.54E-03	3.20E-09	--	1.14E-09	6.62E-09
Benzo(a)pyrene	Offsite	Adult Worker	18-43	6.36E-03	3.11E-09	--	1.11E-09	6.43E-09
Benzo(k)fluoranthene	Offsite	Adult Worker	18-43	7.35E-03	3.60E-09	--	1.28E-09	7.44E-09
Chromium VI	Offsite	Adult Worker	18-43	2.17E-02	1.06E-08	2.12E-06	3.79E-09	1.59E-09
Chrysene	Offsite	Adult Worker	18-43	7.63E-03	3.73E-09	--	1.33E-09	7.72E-09
Indeno(1,2,3-cd)pyrene	Offsite	Adult Worker	18-43	1.00E-02	4.90E-09	--	1.75E-09	1.01E-08
Thallium	Offsite	Adult Worker	18-43	1.55E-01	7.58E-08	1.08E-03	2.71E-08	--
Sum Total	Offsite	Adult Worker	18-43	N/A	N/A	1.17E-03	N/A	5.69E-08

Table 4-36. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Outdoor Air - Offsite Workers During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Adult Worker	18-27	1.09E-05	1.43E-07	--	2.05E-09	3.09E-08
Benzo(a)anthracene	Offsite	Adult Worker	18-27	2.13E-07	2.80E-09	--	4.00E-11	2.44E-10
Benzo(a)pyrene	Offsite	Adult Worker	18-27	2.09E-07	2.75E-09	--	3.92E-11	2.40E-10
Benzo(k)fluoranthene	Offsite	Adult Worker	18-27	2.24E-07	2.95E-09	--	4.20E-11	2.57E-10
Chromium VI	Offsite	Adult Worker	18-27	4.26E-06	5.60E-08	--	8.00E-10	3.36E-08
Chrysene	Offsite	Adult Worker	18-27	2.46E-07	3.24E-09	--	4.62E-11	2.82E-10
Indeno(1,2,3-cd)pyrene	Offsite	Adult Worker	18-27	3.50E-07	4.60E-09	--	6.57E-11	4.01E-10
Thallium	Offsite	Adult Worker	18-27	3.04E-05	4.00E-07	--	5.71E-09	--
Sum Total	Offsite	Adult Worker	18-27	N/A	N/A	--	N/A	6.59E-08

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic subchronic and chronic daily intake (SDIn, CDIc) dose calculated based on intake assumptions for inhalation of dust pathway and air concentrations presented in Tables 4-10 and 4-21.
/c/ HQ = Hazard Quotient (Dose/sRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-36. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Outdoor Air - Offsite Workers During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Arsenic	Offsite	Adult Worker	18-43	1.09E-05	2.56E-06	--	3.66E-08	5.52E-07
Benzo(a)anthracene	Offsite	Adult Worker	18-43	1.28E-06	3.01E-07	--	4.29E-09	2.62E-08
Benzo(a)pyrene	Offsite	Adult Worker	18-43	1.25E-06	2.94E-07	--	4.19E-09	2.56E-08
Benzo(k)fluoranthene	Offsite	Adult Worker	18-43	1.44E-06	3.38E-07	--	4.83E-09	2.95E-08
Chromium VI	Offsite	Adult Worker	18-43	4.26E-06	1.00E-06	--	1.43E-08	6.00E-07
Chrysene	Offsite	Adult Worker	18-43	1.50E-06	3.52E-07	--	5.03E-09	3.07E-08
Indeno(1,2,3-cd)pyrene	Offsite	Adult Worker	18-43	2.00E-06	4.70E-07	--	6.71E-09	4.09E-08
Thallium	Offsite	Adult Worker	18-43	3.04E-05	7.14E-06	--	1.02E-07	--
Sum Total	Offsite	Adult Worker	18-43	N/A	N/A	--	N/A	1.30E-06

Excerpts from "Site Assessment 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1992

Table 4-37: Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	5.57E-02	7.47E-08	2.49E-04	5.34E-09	N/A
	Offsite	Child Resident	5- 9	5.57E-02	4.90E-08	1.63E-04	2.80E-09	N/A
	Offsite	Child Resident	0- 9	5.57E-02	N/A	N/A	8.14E-09	1.42E-08
	Offsite	Adult Resident	18-27	5.57E-02	1.75E-08	5.82E-05	2.24E-09	3.93E-09
Benzo(a)anthracene	Offsite	Child Resident	0- 5	1.09E-03	2.19E-08	--	1.57E-09	N/A
	Offsite	Child Resident	5- 9	1.09E-03	1.44E-08	--	8.23E-10	N/A
	Offsite	Child Resident	0- 9	1.09E-03	N/A	N/A	2.39E-09	1.38E-08
	Offsite	Adult Resident	18-27	1.09E-03	5.12E-09	--	6.58E-10	3.81E-09
Benzo(a)pyrene	Offsite	Child Resident	0- 5	1.07E-03	2.15E-08	--	1.54E-09	N/A
	Offsite	Child Resident	5- 9	1.07E-03	1.41E-08	--	8.08E-10	N/A
	Offsite	Child Resident	0- 9	1.07E-03	N/A	N/A	2.34E-09	1.36E-08
	Offsite	Adult Resident	18-27	1.07E-03	5.03E-09	--	6.46E-10	3.74E-09
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	1.14E-03	2.29E-08	--	1.64E-09	N/A
	Offsite	Child Resident	5- 9	1.14E-03	1.51E-08	--	8.60E-10	N/A
	Offsite	Child Resident	0- 9	1.14E-03	N/A	N/A	2.50E-09	1.45E-08
	Offsite	Adult Resident	18-27	1.14E-03	5.36E-09	--	6.89E-10	3.99E-09
Chromium VI	Offsite	Child Resident	0- 5	2.17E-02	2.91E-08	5.82E-06	2.08E-09	N/A
	Offsite	Child Resident	5- 9	2.17E-02	1.91E-08	3.82E-06	1.09E-09	N/A
	Offsite	Child Resident	0- 9	2.17E-02	N/A	N/A	3.17E-09	1.33E-09
	Offsite	Adult Resident	18-27	2.17E-02	6.80E-09	1.36E-06	8.74E-10	3.67E-10
Chrysene	Offsite	Child Resident	0- 5	1.25E-03	2.51E-08	--	1.80E-09	N/A
	Offsite	Child Resident	5- 9	1.25E-03	1.65E-08	--	9.43E-10	N/A
	Offsite	Child Resident	0- 9	1.25E-03	N/A	N/A	2.74E-09	1.59E-08
	Offsite	Adult Resident	18-27	1.25E-03	5.87E-09	--	7.55E-10	4.37E-09
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	1.79E-03	3.60E-08	--	2.57E-09	N/A
	Offsite	Child Resident	5- 9	1.79E-03	2.36E-08	--	1.35E-09	N/A
	Offsite	Child Resident	0- 9	1.79E-03	N/A	N/A	3.92E-09	2.27E-08
	Offsite	Adult Resident	18-27	1.79E-03	8.41E-09	--	1.08E-09	6.26E-09
Thallium	Offsite	Child Resident	0- 5	1.55E-01	2.08E-07	2.97E-03	1.48E-08	N/A
	Offsite	Child Resident	5- 9	1.55E-01	1.36E-07	1.95E-03	7.80E-09	N/A
	Offsite	Child Resident	0- 9	1.55E-01	N/A	N/A	2.26E-08	--
	Offsite	Adult Resident	18-27	1.55E-01	4.86E-08	6.94E-04	6.24E-09	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for dermal contact pathway and soil concentrations presented in Tables 4-10 and 4-12a.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-37 Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	3.22E-03	N/A	N/A
	Offsite	Child Resident	5- 9	N/A	N/A	2.12E-03	N/A	N/A
	Offsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	9.60E-08
	Offsite	Adult Resident	18-27	N/A	N/A	7.54E-04	N/A	2.65E-08

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 26, 1990.

Table [illegible] Associated with Exposures from Dermal Contact with Soil - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	5.57E-02	1.76E-07	5.87E-04	1.26E-08	N/A
	Offsite	Child Resident	5-11	5.57E-02	1.25E-07	4.17E-04	1.07E-08	N/A
	Offsite	Child Resident	11-18	5.57E-02	1.02E-07	3.38E-04	1.02E-08	N/A
	Offsite	Adult Resident	18-30	5.57E-02	4.33E-08	1.44E-04	7.43E-09	N/A
	Offsite	Adult Resident	0-30	5.57E-02	N/A	N/A	4.09E-08	7.16E-08
	Offsite	Adult Resident	18-48	5.57E-02	4.33E-08	1.44E-04	1.86E-08	3.25E-08
Benzo(a)anthracene	Offsite	Child Resident	0- 5	6.54E-03	3.10E-07	--	2.22E-08	N/A
	Offsite	Child Resident	5-11	6.54E-03	2.21E-07	--	1.89E-08	N/A
	Offsite	Child Resident	11-18	6.54E-03	1.79E-07	--	1.79E-08	N/A
	Offsite	Adult Resident	18-30	6.54E-03	7.63E-08	--	1.31E-08	N/A
	Offsite	Adult Resident	0-30	6.54E-03	N/A	N/A	7.20E-08	4.17E-07
	Offsite	Adult Resident	18-48	6.54E-03	7.63E-08	--	3.27E-08	1.89E-07
Benzo(a)pyrene	Offsite	Child Resident	0- 5	6.36E-03	3.02E-07	--	2.16E-08	N/A
	Offsite	Child Resident	5-11	6.36E-03	2.14E-07	--	1.84E-08	N/A
	Offsite	Child Resident	11-18	6.36E-03	1.74E-07	--	1.74E-08	N/A
	Offsite	Adult Resident	18-30	6.36E-03	7.42E-08	--	1.27E-08	N/A
	Offsite	Adult Resident	0-30	6.36E-03	N/A	N/A	7.00E-08	4.06E-07
	Offsite	Adult Resident	18-48	6.36E-03	7.42E-08	--	3.18E-08	1.84E-07
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	7.35E-03	3.49E-07	--	2.49E-08	N/A
	Offsite	Child Resident	5-11	7.35E-03	2.48E-07	--	2.12E-08	N/A
	Offsite	Child Resident	11-18	7.35E-03	2.01E-07	--	2.01E-08	N/A
	Offsite	Adult Resident	18-30	7.35E-03	8.58E-08	--	1.47E-08	N/A
	Offsite	Adult Resident	0-30	7.35E-03	N/A	N/A	8.10E-08	4.69E-07
	Offsite	Adult Resident	18-48	7.35E-03	8.58E-08	--	3.68E-08	2.13E-07
Chromium VI	Offsite	Child Resident	0- 5	2.17E-02	6.86E-08	1.37E-05	4.90E-09	N/A
	Offsite	Child Resident	5-11	2.17E-02	4.88E-08	9.76E-06	4.18E-09	N/A
	Offsite	Child Resident	11-18	2.17E-02	3.96E-08	7.91E-06	3.96E-09	N/A
	Offsite	Adult Resident	18-30	2.17E-02	1.69E-08	3.38E-06	2.89E-09	N/A
	Offsite	Adult Resident	0-30	2.17E-02	N/A	N/A	1.59E-08	6.69E-09
	Offsite	Adult Resident	18-48	2.17E-02	1.69E-08	3.38E-06	7.24E-09	3.04E-09
Chrysene	Offsite	Child Resident	0- 5	7.63E-03	3.62E-07	--	2.59E-08	N/A
	Offsite	Child Resident	5-11	7.63E-03	2.57E-07	--	2.21E-08	N/A
	Offsite	Child Resident	11-18	7.63E-03	2.09E-07	--	2.09E-08	N/A
	Offsite	Adult Resident	18-30	7.63E-03	8.91E-08	--	1.53E-08	N/A
	Offsite	Adult Resident	0-30	7.63E-03	N/A	N/A	8.40E-08	4.87E-07
	Offsite	Adult Resident	18-48	7.63E-03	8.91E-08	--	3.82E-08	2.21E-07
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	1.02E-02	4.84E-07	--	3.46E-08	N/A
	Offsite	Child Resident	5-11	1.02E-02	3.44E-07	--	2.95E-08	N/A
	Offsite	Child Resident	11-18	1.02E-02	2.79E-07	--	2.79E-08	N/A
	Offsite	Adult Resident	18-30	1.02E-02	1.19E-07	--	2.04E-08	N/A
	Offsite	Adult Resident	0-30	1.02E-02	N/A	N/A	1.12E-07	6.50E-07
	Offsite	Adult Resident	18-48	1.02E-02	1.19E-07	--	5.10E-08	2.95E-07

Table 37. [illegible] Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects
Associated with Exposures from Dermal Contact with Soil - Offsite Residents
During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Offsite	Child Resident	0- 5	1.55E-01	4.90E-07	7.00E-03	3.50E-08	N/A
	Offsite	Child Resident	5-11	1.55E-01	3.48E-07	4.98E-03	2.99E-08	N/A
	Offsite	Child Resident	11-18	1.55E-01	2.83E-07	4.04E-03	2.83E-08	N/A
	Offsite	Adult Resident	18-30	1.55E-01	1.21E-07	1.72E-03	2.07E-08	N/A
	Offsite	Adult Resident	0-30	1.55E-01	N/A	N/A	1.14E-07	--
	Offsite	Adult Resident	18-48	1.55E-01	1.21E-07	1.72E-03	5.17E-08	--
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	7.60E-03	N/A	N/A
	Offsite	Child Resident	5-11	N/A	N/A	5.41E-03	N/A	N/A
	Offsite	Child Resident	11-18	N/A	N/A	4.39E-03	N/A	N/A
	Offsite	Adult Resident	18-30	N/A	N/A	1.87E-03	N/A	N/A
	Offsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	2.51E-06
	Offsite	Adult Resident	18-48	N/A	N/A	1.87E-03	N/A	1.14E-06

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-38. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Offsite Residents During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	5.57E-02	8.22E-07	2.74E-03	5.87E-08	N/A
	Offsite	Child Resident	5- 9	5.57E-02	2.23E-07	7.42E-04	1.27E-08	N/A
	Offsite	Child Resident	0- 9	5.57E-02	N/A	N/A	7.14E-08	1.25E-07
	Offsite	Adult Resident	18-27	5.57E-02	7.63E-08	2.54E-04	9.81E-09	1.72E-08
Benzo(a)anthracene	Offsite	Child Resident	0- 5	1.09E-03	1.61E-08	--	1.15E-09	N/A
	Offsite	Child Resident	5- 9	1.09E-03	4.35E-09	--	2.49E-10	N/A
	Offsite	Child Resident	0- 9	1.09E-03	N/A	N/A	1.40E-09	8.09E-09
	Offsite	Adult Resident	18-27	1.09E-03	1.49E-09	--	1.92E-10	1.11E-09
Benzo(a)pyrene	Offsite	Child Resident	0- 5	1.07E-03	1.58E-08	--	1.13E-09	N/A
	Offsite	Child Resident	5- 9	1.07E-03	4.28E-09	--	2.44E-10	N/A
	Offsite	Child Resident	0- 9	1.07E-03	N/A	N/A	1.37E-09	7.94E-09
	Offsite	Adult Resident	18-27	1.07E-03	1.47E-09	--	1.88E-10	1.09E-09
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	1.14E-03	1.68E-08	--	1.20E-09	N/A
	Offsite	Child Resident	5- 9	1.14E-03	4.55E-09	--	2.60E-10	N/A
	Offsite	Child Resident	0- 9	1.14E-03	N/A	N/A	1.46E-09	8.46E-09
	Offsite	Adult Resident	18-27	1.14E-03	1.56E-09	--	2.01E-10	1.16E-09
Chromium VI	Offsite	Child Resident	0- 5	2.17E-02	3.20E-07	6.40E-05	2.29E-08	N/A
	Offsite	Child Resident	5- 9	2.17E-02	8.67E-08	1.73E-05	4.95E-09	N/A
	Offsite	Child Resident	0- 9	2.17E-02	N/A	N/A	2.78E-08	1.17E-08
	Offsite	Adult Resident	18-27	2.17E-02	2.97E-08	5.95E-06	3.82E-09	1.61E-09
Chrysene	Offsite	Child Resident	0- 5	1.25E-03	1.84E-08	--	1.32E-09	N/A
	Offsite	Child Resident	5- 9	1.25E-03	4.99E-09	--	2.85E-10	N/A
	Offsite	Child Resident	0- 9	1.25E-03	N/A	N/A	1.60E-09	9.28E-09
	Offsite	Adult Resident	18-27	1.25E-03	1.71E-09	--	2.20E-10	1.27E-09
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	1.79E-03	2.64E-08	--	1.89E-09	N/A
	Offsite	Child Resident	5- 9	1.79E-03	7.15E-09	--	4.09E-10	N/A
	Offsite	Child Resident	0- 9	1.79E-03	N/A	N/A	2.29E-09	1.33E-08
	Offsite	Adult Resident	18-27	1.79E-03	2.45E-09	--	3.15E-10	1.83E-09
Thallium	Offsite	Child Resident	0- 5	1.55E-02	2.29E-07	3.27E-03	1.63E-08	N/A
	Offsite	Child Resident	5- 9	1.55E-02	6.19E-08	8.85E-04	3.54E-09	N/A
	Offsite	Child Resident	0- 9	1.55E-02	N/A	N/A	1.99E-08	--
	Offsite	Adult Resident	18-27	1.55E-02	2.12E-08	3.03E-04	2.73E-09	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for ingestion pathway and soil concentrations presented in Tables 4-10 and 4-13a.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table [illegible]38 Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects
Associated with Exposures from Ingestion of Soil - Offsite Residents
During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	6.07E-03	N/A	N/A
	Offsite	Child Resident	5- 9	N/A	N/A	1.64E-03	N/A	N/A
	Offsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	1.84E-07
	Offsite	Adult Resident	18-27	N/A	N/A	5.63E-04	N/A	2.53E-08

Table 4-38. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO				
				Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	5.57E-02	8.22E-07	2.74E-03	5.87E-08	N/A
	Offsite	Child Resident	5-11	5.57E-02	1.98E-07	6.59E-04	1.70E-08	N/A
	Offsite	Child Resident	11-18	5.57E-02	9.89E-08	3.30E-04	9.89E-09	N/A
	Offsite	Adult Resident	18-30	5.57E-02	7.63E-08	2.54E-04	1.31E-08	N/A
	Offsite	Adult Resident	0-30	5.57E-02	N/A	N/A	9.86E-08	1.73E-07
	Offsite	Adult Resident	18-48	5.57E-02	7.63E-08	2.54E-04	3.27E-08	5.72E-08
Benzo(a)anthracene	Offsite	Child Resident	0- 5	6.54E-03	9.65E-08	--	6.89E-09	N/A
	Offsite	Child Resident	5-11	6.54E-03	2.32E-08	--	1.99E-09	N/A
	Offsite	Child Resident	11-18	6.54E-03	1.16E-08	--	1.16E-09	N/A
	Offsite	Adult Resident	18-30	6.54E-03	8.96E-09	--	1.54E-09	N/A
	Offsite	Adult Resident	0-30	6.54E-03	N/A	N/A	1.16E-08	6.70E-08
	Offsite	Adult Resident	18-48	6.54E-03	8.96E-09	--	3.84E-09	2.22E-08
Benzo(a)pyrene	Offsite	Child Resident	0- 5	6.36E-03	9.38E-08	--	6.70E-09	N/A
	Offsite	Child Resident	5-11	6.36E-03	2.26E-08	--	1.94E-09	N/A
	Offsite	Child Resident	11-18	6.36E-03	1.13E-08	--	1.13E-09	N/A
	Offsite	Adult Resident	18-30	6.36E-03	8.71E-09	--	1.49E-09	N/A
	Offsite	Adult Resident	0-30	6.36E-03	N/A	N/A	1.13E-08	6.52E-08
	Offsite	Adult Resident	18-48	6.36E-03	8.71E-09	--	3.73E-09	2.16E-08
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	7.35E-03	1.08E-07	--	7.74E-09	N/A
	Offsite	Child Resident	5-11	7.35E-03	2.61E-08	--	2.24E-09	N/A
	Offsite	Child Resident	11-18	7.35E-03	1.31E-08	--	1.31E-09	N/A
	Offsite	Adult Resident	18-30	7.35E-03	1.01E-08	--	1.73E-09	N/A
	Offsite	Adult Resident	0-30	7.35E-03	N/A	N/A	1.30E-08	7.53E-08
	Offsite	Adult Resident	18-48	7.35E-03	1.01E-08	--	4.32E-09	2.50E-08
Chromium VI	Offsite	Child Resident	0- 5	2.17E-02	3.20E-07	6.40E-05	2.29E-08	N/A
	Offsite	Child Resident	5-11	2.17E-02	7.71E-08	1.54E-05	6.61E-09	N/A
	Offsite	Child Resident	11-18	2.17E-02	3.85E-08	7.71E-06	3.85E-09	N/A
	Offsite	Adult Resident	18-30	2.17E-02	2.97E-08	5.95E-06	5.10E-09	N/A
	Offsite	Adult Resident	0-30	2.17E-02	N/A	N/A	3.84E-08	1.61E-08
	Offsite	Adult Resident	18-48	2.17E-02	2.97E-08	5.95E-06	1.27E-08	5.35E-09
Chrysene	Offsite	Child Resident	0- 5	7.63E-03	1.13E-07	--	8.04E-09	N/A
	Offsite	Child Resident	5-11	7.63E-03	2.71E-08	--	2.32E-09	N/A
	Offsite	Child Resident	11-18	7.63E-03	1.35E-08	--	1.35E-09	N/A
	Offsite	Adult Resident	18-30	7.63E-03	1.05E-08	--	1.79E-09	N/A
	Offsite	Adult Resident	0-30	7.63E-03	N/A	N/A	1.35E-08	7.82E-08
	Offsite	Adult Resident	18-48	7.63E-03	1.05E-08	--	4.48E-09	2.59E-08
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	1.02E-02	1.50E-07	--	1.07E-08	N/A
	Offsite	Child Resident	5-11	1.02E-02	3.62E-08	--	3.10E-09	N/A
	Offsite	Child Resident	11-18	1.02E-02	1.81E-08	--	1.81E-09	N/A
	Offsite	Adult Resident	18-30	1.02E-02	1.40E-08	--	2.40E-09	N/A
	Offsite	Adult Resident	0-30	1.02E-02	N/A	N/A	1.81E-08	1.05E-07
	Offsite	Adult Resident	18-48	1.02E-02	1.40E-08	--	5.99E-09	3.47E-08

Table 4-38. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Offsite Residents During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Offsite	Child Resident	0- 5	1.55E-01	2.29E-06	3.27E-02	1.63E-07	N/A
	Offsite	Child Resident	5-11	1.55E-01	5.50E-07	7.86E-03	4.72E-08	N/A
	Offsite	Child Resident	11-18	1.55E-01	2.75E-07	3.93E-03	2.75E-08	N/A
	Offsite	Adult Resident	18-30	1.55E-01	2.12E-07	3.03E-03	3.64E-08	N/A
	Offsite	Adult Resident	0-30	1.55E-01	N/A	N/A	2.74E-07	--
	Offsite	Adult Resident	18-48	1.55E-01	2.12E-07	3.03E-03	9.10E-08	--
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	3.55E-02	N/A	N/A
	Offsite	Child Resident	5-11	N/A	N/A	8.53E-03	N/A	N/A
	Offsite	Child Resident	11-18	N/A	N/A	4.27E-03	N/A	N/A
	Offsite	Adult Resident	18-30	N/A	N/A	3.29E-03	N/A	N/A
	Offsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	5.80E-07
	Offsite	Adult Resident	18-48	N/A	N/A	3.29E-03	N/A	1.92E-07

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-39. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Local/Homegrown Fruits - Offsite Residents During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	5.96E-06	2.46E-09	8.21E-06	1.76E-10	N/A
	Offsite	Child Resident	5- 9	5.96E-06	1.43E-09	4.76E-06	8.16E-11	N/A
	Offsite	Child Resident	0- 9	5.96E-06	N/A	N/A	2.57E-10	4.51E-10
	Offsite	Adult Resident	18-27	5.96E-06	3.92E-10	1.31E-06	5.03E-11	8.81E-11
Benzo(a)anthracene	Offsite	Child Resident	0- 5	6.45E-08	2.66E-11	--	1.90E-12	N/A
	Offsite	Child Resident	5- 9	6.45E-08	1.54E-11	--	8.84E-13	N/A
	Offsite	Child Resident	0- 9	6.45E-08	N/A	N/A	2.79E-12	1.61E-11
	Offsite	Adult Resident	18-27	6.45E-08	4.24E-12	--	5.45E-13	3.16E-12
Benzo(a)pyrene	Offsite	Child Resident	0- 5	3.47E-08	1.43E-11	--	1.02E-12	N/A
	Offsite	Child Resident	5- 9	3.47E-08	8.32E-12	--	4.75E-13	N/A
	Offsite	Child Resident	0- 9	3.47E-08	N/A	N/A	1.50E-12	8.68E-12
	Offsite	Adult Resident	18-27	3.47E-08	2.28E-12	--	2.93E-13	1.70E-12
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	3.72E-08	1.53E-11	--	1.10E-12	N/A
	Offsite	Child Resident	5- 9	3.72E-08	8.92E-12	--	5.10E-13	N/A
	Offsite	Child Resident	0- 9	3.72E-08	N/A	N/A	1.61E-12	9.31E-12
	Offsite	Adult Resident	18-27	3.72E-08	2.45E-12	--	3.14E-13	1.82E-12
Chromium VI	Offsite	Child Resident	0- 5	4.07E-06	1.68E-09	3.36E-07	1.20E-10	N/A
	Offsite	Child Resident	5- 9	4.07E-06	9.76E-10	1.95E-07	5.57E-11	N/A
	Offsite	Child Resident	0- 9	4.07E-06	N/A	N/A	1.76E-10	7.38E-11
	Offsite	Adult Resident	18-27	4.07E-06	2.68E-10	5.35E-08	3.44E-11	1.44E-11
Chrysene	Offsite	Child Resident	0- 5	7.43E-08	3.06E-11	--	2.19E-12	N/A
	Offsite	Child Resident	5- 9	7.43E-08	1.78E-11	--	1.02E-12	N/A
	Offsite	Child Resident	0- 9	7.43E-08	N/A	N/A	3.21E-12	1.85E-11
	Offsite	Adult Resident	18-27	7.43E-08	4.89E-12	--	6.28E-13	3.64E-12
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	3.24E-08	1.33E-11	--	9.56E-13	N/A
	Offsite	Child Resident	5- 9	3.24E-08	7.77E-12	--	4.44E-13	N/A
	Offsite	Child Resident	0- 9	3.24E-08	N/A	N/A	1.40E-12	8.10E-12
	Offsite	Adult Resident	18-27	3.24E-08	2.13E-12	--	2.74E-13	1.59E-12
Thallium	Offsite	Child Resident	0- 5	1.67E-06	6.90E-10	9.85E-06	4.92E-11	N/A
	Offsite	Child Resident	5- 9	1.67E-06	4.00E-10	5.72E-06	2.28E-11	N/A
	Offsite	Child Resident	0- 9	1.67E-06	N/A	N/A	7.21E-11	--
	Offsite	Adult Resident	18-27	1.67E-06	1.10E-10	1.57E-06	1.41E-11	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for ingestion pathway and fruit concentrations presented in Tables 4-10 and 4-22.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-39. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Local/Homegrown Fruits - Offsite Residents During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	1.84E-05	N/A	N/A
	Offsite	Child Resident	5- 9	N/A	N/A	1.07E-05	N/A	N/A
	Offsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	5.85E-10
	Offsite	Adult Resident	18-27	N/A	N/A	2.93E-06	N/A	1.14E-10

Table 4-39. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Local/Homegrown Fruits - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	5.96E-06	9.23E-09	3.08E-05	6.59E-10	N/A
	Offsite	Child Resident	5-11	5.96E-06	4.76E-09	1.59E-05	4.08E-10	N/A
	Offsite	Child Resident	11-18	5.96E-06	2.22E-09	7.41E-06	2.22E-10	N/A
	Offsite	Adult Resident	18-30	5.96E-06	1.47E-09	4.90E-06	2.52E-10	N/A
	Offsite	Adult Resident	0-30	5.96E-06	N/A	N/A	1.54E-09	2.70E-09
	Offsite	Adult Resident	18-48	5.96E-06	1.59E-09	5.31E-06	6.82E-10	1.19E-09
Benzo(a)anthracene	Offsite	Child Resident	0- 5	3.88E-07	6.01E-10	--	4.29E-11	N/A
	Offsite	Child Resident	5-11	3.88E-07	3.10E-10	--	2.65E-11	N/A
	Offsite	Child Resident	11-18	3.88E-07	1.45E-10	--	1.44E-11	N/A
	Offsite	Adult Resident	18-30	3.88E-07	9.56E-11	--	1.64E-11	N/A
	Offsite	Adult Resident	0-30	3.88E-07	N/A	N/A	1.00E-10	5.81E-10
	Offsite	Adult Resident	18-48	3.88E-07	1.04E-10	--	4.44E-11	2.57E-10
Benzo(a)pyrene	Offsite	Child Resident	0- 5	2.07E-07	3.21E-10	--	2.29E-11	N/A
	Offsite	Child Resident	5-11	2.07E-07	1.65E-10	--	1.41E-11	N/A
	Offsite	Child Resident	11-18	2.07E-07	7.71E-11	--	7.72E-12	N/A
	Offsite	Adult Resident	18-30	2.07E-07	5.10E-11	--	8.75E-12	N/A
	Offsite	Adult Resident	0-30	2.07E-07	N/A	N/A	5.35E-11	3.10E-10
	Offsite	Adult Resident	18-48	2.07E-07	5.52E-11	--	2.36E-11	1.37E-10
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	2.40E-07	3.72E-10	--	2.65E-11	N/A
	Offsite	Child Resident	5-11	2.40E-07	1.92E-10	--	1.64E-11	N/A
	Offsite	Child Resident	11-18	2.40E-07	8.94E-11	--	8.95E-12	N/A
	Offsite	Adult Resident	18-30	2.40E-07	5.91E-11	--	1.01E-11	N/A
	Offsite	Adult Resident	0-30	2.40E-07	N/A	N/A	6.20E-11	3.59E-10
	Offsite	Adult Resident	18-48	2.40E-07	6.41E-11	--	2.74E-11	1.59E-10
Chromium VI	Offsite	Child Resident	0- 5	4.07E-06	6.30E-09	1.26E-06	4.50E-10	N/A
	Offsite	Child Resident	5-11	4.07E-06	3.25E-09	6.50E-07	2.79E-10	N/A
	Offsite	Child Resident	11-18	4.07E-06	1.52E-09	3.04E-07	1.52E-10	N/A
	Offsite	Adult Resident	18-30	4.07E-06	1.00E-09	2.01E-07	1.72E-10	N/A
	Offsite	Adult Resident	0-30	4.07E-06	N/A	N/A	1.05E-09	4.42E-10
	Offsite	Adult Resident	18-48	4.07E-06	1.09E-09	2.17E-07	4.66E-10	1.96E-10
Chrysene	Offsite	Child Resident	0- 5	4.52E-07	7.00E-10	--	5.00E-11	N/A
	Offsite	Child Resident	5-11	4.52E-07	3.61E-10	--	3.09E-11	N/A
	Offsite	Child Resident	11-18	4.52E-07	1.69E-10	--	1.68E-11	N/A
	Offsite	Adult Resident	18-30	4.52E-07	1.11E-10	--	1.91E-11	N/A
	Offsite	Adult Resident	0-30	4.52E-07	N/A	N/A	1.17E-10	6.77E-10
	Offsite	Adult Resident	18-48	4.52E-07	1.21E-10	--	5.17E-11	3.00E-10
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	1.85E-07	2.86E-10	--	2.04E-11	N/A
	Offsite	Child Resident	5-11	1.85E-07	1.48E-10	--	1.26E-11	N/A
	Offsite	Child Resident	11-18	1.85E-07	6.89E-11	--	6.90E-12	N/A
	Offsite	Adult Resident	18-30	1.85E-07	4.56E-11	--	7.82E-12	N/A
	Offsite	Adult Resident	0-30	1.85E-07	N/A	N/A	4.78E-11	2.77E-10
	Offsite	Adult Resident	18-48	1.85E-07	4.94E-11	--	2.11E-11	1.23E-10

Table 4-39. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Local/Homegrown Fruits - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Offsite	Child Resident	0- 5	1.67E-06	2.59E-09	3.70E-05	1.85E-10	N/A
	Offsite	Child Resident	5-11	1.67E-06	1.33E-09	1.91E-05	1.14E-10	N/A
	Offsite	Child Resident	11-18	1.67E-06	6.23E-10	8.90E-06	6.22E-11	N/A
	Offsite	Adult Resident	18-30	1.67E-06	4.12E-10	5.88E-06	7.05E-11	N/A
	Offsite	Adult Resident	0-30	1.67E-06	N/A	N/A	4.32E-10	--
	Offsite	Adult Resident	18-48	1.67E-06	4.46E-10	6.37E-06	1.91E-10	--
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	6.91E-05	N/A	N/A
	Offsite	Child Resident	5-11	N/A	N/A	3.56E-05	N/A	N/A
	Offsite	Child Resident	11-18	N/A	N/A	1.66E-05	N/A	N/A
	Offsite	Adult Resident	18-30	N/A	N/A	1.10E-05	N/A	N/A
	Offsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	5.35E-09
	Offsite	Adult Resident	18-48	N/A	N/A	1.19E-05	N/A	2.36E-09

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

--ion of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects
:d with Exposures from Ingestion of Local/Homegrown Vegetables - Offsite Residents
nstruction Scenario /a/

				AVERAGE SCENARIO				
	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
	Offsite	Child Resident	0- 5	1.10E-05	4.06E-09	1.35E-05	2.90E-10	N/A
	Offsite	Child Resident	5- 9	1.10E-05	3.08E-09	1.03E-05	1.76E-10	N/A
	Offsite	Child Resident	0- 9	1.10E-05	N/A	N/A	4.65E-10	8.15E-10
	Offsite	Adult Resident	18-27	1.10E-05	1.51E-09	5.02E-06	1.94E-10	3.39E-10
	Offsite	Child Resident	0- 5	1.19E-07	4.38E-11	--	3.13E-12	N/A
	Offsite	Child Resident	5- 9	1.19E-07	3.32E-11	--	1.90E-12	N/A
	Offsite	Child Resident	0- 9	1.19E-07	N/A	N/A	5.04E-12	2.91E-11
	Offsite	Adult Resident	18-27	1.19E-07	1.63E-11	--	2.10E-12	1.21E-11
	Offsite	Child Resident	0- 5	6.39E-08	2.35E-11	--	1.68E-12	N/A
	Offsite	Child Resident	5- 9	6.39E-08	1.78E-11	--	1.02E-12	N/A
	Offsite	Child Resident	0- 9	6.39E-08	N/A	N/A	2.70E-12	1.56E-11
	Offsite	Adult Resident	18-27	6.39E-08	8.75E-12	--	1.13E-12	6.52E-12
ne	Offsite	Child Resident	0- 5	6.85E-08	2.52E-11	--	1.80E-12	N/A
	Offsite	Child Resident	5- 9	6.85E-08	1.91E-11	--	1.09E-12	N/A
	Offsite	Child Resident	0- 9	6.85E-08	N/A	N/A	2.90E-12	1.67E-11
	Offsite	Adult Resident	18-27	6.85E-08	9.38E-12	--	1.21E-12	6.99E-12
	Offsite	Child Resident	0- 5	7.50E-06	2.77E-09	5.53E-07	1.97E-10	N/A
	Offsite	Child Resident	5- 9	7.50E-06	2.10E-09	4.20E-07	1.20E-10	N/A
	Offsite	Child Resident	0- 9	7.50E-06	N/A	N/A	3.17E-10	1.33E-10
	Offsite	Adult Resident	18-27	7.50E-06	1.03E-09	2.05E-07	1.32E-10	5.54E-11
	Offsite	Child Resident	0- 5	1.37E-07	5.05E-11	--	3.61E-12	N/A
	Offsite	Child Resident	5- 9	1.37E-07	3.83E-11	--	2.19E-12	N/A
	Offsite	Child Resident	0- 9	1.37E-07	N/A	N/A	5.80E-12	3.35E-11
	Offsite	Adult Resident	18-27	1.37E-07	1.87E-11	--	2.41E-12	1.39E-11
e	Offsite	Child Resident	0- 5	5.97E-08	2.20E-11	--	1.57E-12	N/A
	Offsite	Child Resident	5- 9	5.97E-08	1.66E-11	--	9.54E-13	N/A
	Offsite	Child Resident	0- 9	5.97E-08	N/A	N/A	2.53E-12	1.46E-11
	Offsite	Adult Resident	18-27	5.97E-08	8.18E-12	--	1.05E-12	6.09E-12
	Offsite	Child Resident	0- 5	3.08E-06	1.14E-09	1.62E-05	8.11E-11	N/A
	Offsite	Child Resident	5- 9	3.08E-06	8.61E-10	1.23E-05	4.92E-11	N/A
	Offsite	Child Resident	0- 9	3.08E-06	N/A	N/A	1.30E-10	--
	Offsite	Adult Resident	18-27	3.08E-06	4.22E-10	6.03E-06	5.42E-11	--

planation.
ic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake
for ingestion pathway and vegetable concentrations presented in Tables 4-10 and 4-23.
tient (Dose/cRfD); used to evaluate noncarcinogenic effects.
enic Slope Factor x Dose; used to evaluate carcinogenic effects.

licable
ot calculable

:s

:c /b/ /day)	RISK /d/
N/A	N/A
N/A	N/A
N/A	1.06E-09
N/A	4.40E-10

Table 4-40. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Local/Homegrown Vegetables - Offsite Residents During Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Arsenic	Offsite	Child Resident	0- 5	1.10E-05	1.62E-08	5.41E-05	1.16E-09	N/A
	Offsite	Child Resident	5-11	1.10E-05	1.17E-08	3.91E-05	1.00E-09	N/A
	Offsite	Child Resident	11-18	1.10E-05	7.03E-09	2.34E-05	7.03E-10	N/A
	Offsite	Adult Resident	18-30	1.10E-05	6.03E-09	2.01E-05	1.03E-09	N/A
	Offsite	Adult Resident	0-30	1.10E-05	N/A	N/A	3.90E-09	6.83E-09
	Offsite	Adult Resident	18-48	1.10E-05	6.93E-09	2.31E-05	2.97E-09	5.20E-09
Benzo(a)anthracene	Offsite	Child Resident	0- 5	7.14E-07	1.05E-09	--	7.52E-11	N/A
	Offsite	Child Resident	5-11	7.14E-07	7.61E-10	--	6.52E-11	N/A
	Offsite	Child Resident	11-18	7.14E-07	4.56E-10	--	4.56E-11	N/A
	Offsite	Adult Resident	18-30	7.14E-07	3.91E-10	--	6.70E-11	N/A
	Offsite	Adult Resident	0-30	7.14E-07	N/A	N/A	2.53E-10	1.47E-09
	Offsite	Adult Resident	18-48	7.14E-07	4.50E-10	--	1.93E-10	1.12E-09
Benzo(a)pyrene	Offsite	Child Resident	0- 5	3.81E-07	5.62E-10	--	4.01E-11	N/A
	Offsite	Child Resident	5-11	3.81E-07	4.06E-10	--	3.47E-11	N/A
	Offsite	Child Resident	11-18	3.81E-07	2.43E-10	--	2.43E-11	N/A
	Offsite	Adult Resident	18-30	3.81E-07	2.09E-10	--	3.57E-11	N/A
	Offsite	Adult Resident	0-30	3.81E-07	N/A	N/A	1.35E-10	7.82E-10
	Offsite	Adult Resident	18-48	3.81E-07	2.40E-10	--	1.03E-10	5.96E-10
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	4.41E-07	6.50E-10	--	4.64E-11	N/A
	Offsite	Child Resident	5-11	4.41E-07	4.70E-10	--	4.02E-11	N/A
	Offsite	Child Resident	11-18	4.41E-07	2.82E-10	--	2.81E-11	N/A
	Offsite	Adult Resident	18-30	4.41E-07	2.42E-10	--	4.14E-11	N/A
	Offsite	Adult Resident	0-30	4.41E-07	N/A	N/A	1.56E-10	9.05E-10
	Offsite	Adult Resident	18-48	4.41E-07	2.78E-10	--	1.19E-10	6.90E-10
Chromium VI	Offsite	Child Resident	0- 5	7.50E-06	1.11E-08	2.21E-06	7.90E-10	N/A
	Offsite	Child Resident	5-11	7.50E-06	7.99E-09	1.60E-06	6.85E-10	N/A
	Offsite	Child Resident	11-18	7.50E-06	4.79E-09	9.59E-07	4.79E-10	N/A
	Offsite	Adult Resident	18-30	7.50E-06	4.11E-09	8.22E-07	7.04E-10	N/A
	Offsite	Adult Resident	0-30	7.50E-06	N/A	N/A	2.66E-09	1.12E-09
	Offsite	Adult Resident	18-48	7.50E-06	4.73E-09	9.45E-07	2.03E-09	8.51E-10
Chrysene	Offsite	Child Resident	0- 5	8.33E-07	1.23E-09	--	8.77E-11	N/A
	Offsite	Child Resident	5-11	8.33E-07	8.87E-10	--	7.60E-11	N/A
	Offsite	Child Resident	11-18	8.33E-07	5.32E-10	--	5.32E-11	N/A
	Offsite	Adult Resident	18-30	8.33E-07	4.56E-10	--	7.82E-11	N/A
	Offsite	Adult Resident	0-30	8.33E-07	N/A	N/A	2.95E-10	1.71E-09
	Offsite	Adult Resident	18-48	8.33E-07	5.25E-10	--	2.25E-10	1.30E-09
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	3.41E-07	5.03E-10	--	3.59E-11	N/A
	Offsite	Child Resident	5-11	3.41E-07	3.63E-10	--	3.11E-11	N/A
	Offsite	Child Resident	11-18	3.41E-07	2.18E-10	--	2.17E-11	N/A
	Offsite	Adult Resident	18-30	3.41E-07	1.87E-10	--	3.20E-11	N/A
	Offsite	Adult Resident	0-30	3.41E-07	N/A	N/A	1.21E-10	7.00E-10
	Offsite	Adult Resident	18-48	3.41E-07	2.15E-10	--	9.20E-11	5.33E-10

Table 4-40. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Local/Homegrown Vegetables - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Offsite	Child Resident	0- 5	3.08E-06	4.54E-09	6.49E-05	3.25E-10	N/A
	Offsite	Child Resident	5-11	3.08E-06	3.28E-09	4.69E-05	2.81E-10	N/A
	Offsite	Child Resident	11-18	3.08E-06	1.97E-09	2.81E-05	1.97E-10	N/A
	Offsite	Adult Resident	18-30	3.08E-06	1.69E-09	2.41E-05	2.89E-10	N/A
	Offsite	Adult Resident	0-30	3.08E-06	N/A	N/A	1.09E-09	--
	Offsite	Adult Resident	18-48	3.08E-06	1.94E-09	2.77E-05	8.32E-10	--
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	1.21E-04	N/A	N/A
	Offsite	Child Resident	5-11	N/A	N/A	8.76E-05	N/A	N/A
	Offsite	Child Resident	11-18	N/A	N/A	5.25E-05	N/A	N/A
	Offsite	Adult Resident	18-30	N/A	N/A	4.50E-05	N/A	N/A
	Offsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	1.35E-08
	Offsite	Adult Resident	18-48	N/A	N/A	5.17E-05	N/A	1.03E-08

Table 4-41. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated Associated with Exposures from Inhalation of Dust in Outdoor Air - Offsite Residents During Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Offsite	Child Resident	0- 5	1.09E-05	1.71E-07	--	2.44E-09	N/A
	Offsite	Child Resident	5- 9	1.09E-05	1.34E-07	--	1.91E-09	N/A
	Offsite	Child Resident	0- 9	1.09E-05	N/A	N/A	4.35E-09	6.57E-08
	Offsite	Adult Resident	18-27	1.09E-05	7.88E-09	--	1.13E-10	1.70E-09
Benzo(a)anthracene	Offsite	Child Resident	0- 5	2.13E-07	3.34E-09	--	4.77E-11	N/A
	Offsite	Child Resident	5- 9	2.13E-07	2.61E-09	--	3.73E-11	N/A
	Offsite	Child Resident	0- 9	2.13E-07	N/A	N/A	8.50E-11	5.19E-10
	Offsite	Adult Resident	18-27	2.13E-07	1.54E-10	--	2.20E-12	1.34E-11
Benzo(a)pyrene	Offsite	Child Resident	0- 5	2.09E-07	3.28E-09	--	4.68E-11	N/A
	Offsite	Child Resident	5- 9	2.09E-07	2.56E-09	--	3.66E-11	N/A
	Offsite	Child Resident	0- 9	2.09E-07	N/A	N/A	8.34E-11	5.09E-10
	Offsite	Adult Resident	18-27	2.09E-07	1.51E-10	--	2.16E-12	1.31E-11
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	2.24E-07	3.51E-09	--	5.01E-11	N/A
	Offsite	Child Resident	5- 9	2.24E-07	2.75E-09	--	3.92E-11	N/A
	Offsite	Child Resident	0- 9	2.24E-07	N/A	N/A	8.94E-11	5.45E-10
	Offsite	Adult Resident	18-27	2.24E-07	1.62E-10	--	2.31E-12	1.41E-11
Chromium VI	Offsite	Child Resident	0- 5	4.26E-06	6.68E-08	--	9.54E-10	N/A
	Offsite	Child Resident	5- 9	4.26E-06	5.22E-08	--	7.46E-10	N/A
	Offsite	Child Resident	0- 9	4.26E-06	N/A	N/A	1.70E-09	7.14E-08
	Offsite	Adult Resident	18-27	4.26E-06	3.08E-09	--	4.40E-11	1.85E-09
Chrysene	Offsite	Child Resident	0- 5	2.46E-07	3.86E-09	--	5.51E-11	N/A
	Offsite	Child Resident	5- 9	2.46E-07	3.02E-09	--	4.30E-11	N/A
	Offsite	Child Resident	0- 9	2.46E-07	N/A	N/A	9.81E-11	5.99E-10
	Offsite	Adult Resident	18-27	2.46E-07	1.78E-10	--	2.54E-12	1.55E-11
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	3.50E-07	5.49E-09	--	7.83E-11	N/A
	Offsite	Child Resident	5- 9	3.50E-07	4.29E-09	--	6.13E-11	N/A
	Offsite	Child Resident	0- 9	3.50E-07	N/A	N/A	1.40E-10	8.52E-10
	Offsite	Adult Resident	18-27	3.50E-07	2.53E-10	--	3.62E-12	2.20E-11
Thallium	Offsite	Child Resident	0- 5	3.04E-05	4.77E-07	--	6.81E-09	N/A
	Offsite	Child Resident	5- 9	3.04E-05	3.73E-07	--	5.32E-09	N/A
	Offsite	Child Resident	0- 9	3.04E-05	N/A	N/A	1.21E-08	--
	Offsite	Adult Resident	18-27	3.04E-05	2.20E-08	--	3.14E-10	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for inhalation of dust pathway and air concentrations presented in Tables 4-10 and 4-14a
/c/ HQ = Hazard Quotient (Dose/sRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-41. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated Associated with Exposures from Inhalation of Dust in Outdoor Air - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Offsite	Child Resident	5- 9	N/A	N/A	--	N/A	N/A
	Offsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	1.40E-07
	Offsite	Adult Resident	18-27	N/A	N/A	--	N/A	3.63E-09

Table 4-41. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated Associated with Exposures from Inhalation of Dust in Outdoor Air - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Arsenic	Offsite	Child Resident	0- 5	1.09E-05	3.54E-06	--	5.05E-08	N/A
	Offsite	Child Resident	5-11	1.09E-05	2.86E-06	--	4.09E-08	N/A
	Offsite	Child Resident	11-18	1.09E-05	1.43E-06	--	2.05E-08	N/A
	Offsite	Adult Resident	18-30	1.09E-05	1.97E-07	--	2.82E-09	N/A
	Offsite	Adult Resident	0-30	1.09E-05	N/A	N/A	1.15E-07	1.73E-06
	Offsite	Adult Resident	18-48	1.09E-05	1.97E-07	--	2.82E-09	4.25E-08
Benzo(a)anthracene	Offsite	Child Resident	0- 5	1.28E-06	4.15E-07	--	5.93E-09	N/A
	Offsite	Child Resident	5-11	1.28E-06	3.36E-07	--	4.81E-09	N/A
	Offsite	Child Resident	11-18	1.28E-06	1.68E-07	--	2.40E-09	N/A
	Offsite	Adult Resident	18-30	1.28E-06	2.31E-08	--	3.31E-10	N/A
	Offsite	Adult Resident	0-30	1.28E-06	N/A	N/A	1.35E-08	8.22E-08
	Offsite	Adult Resident	18-48	1.28E-06	2.31E-08	--	3.31E-10	2.02E-09
Benzo(a)pyrene	Offsite	Child Resident	0- 5	1.25E-06	4.06E-07	--	5.80E-09	N/A
	Offsite	Child Resident	5-11	1.25E-06	3.29E-07	--	4.69E-09	N/A
	Offsite	Child Resident	11-18	1.25E-06	1.64E-07	--	2.35E-09	N/A
	Offsite	Adult Resident	18-30	1.25E-06	2.26E-08	--	3.23E-10	N/A
	Offsite	Adult Resident	0-30	1.25E-06	N/A	N/A	1.32E-08	8.03E-08
	Offsite	Adult Resident	18-48	1.25E-06	2.26E-08	--	3.23E-10	1.97E-09
Benzo(k)fluoranthene	Offsite	Child Resident	0- 5	1.44E-06	4.67E-07	--	6.68E-09	N/A
	Offsite	Child Resident	5-11	1.44E-06	3.78E-07	--	5.41E-09	N/A
	Offsite	Child Resident	11-18	1.44E-06	1.89E-07	--	2.70E-09	N/A
	Offsite	Adult Resident	18-30	1.44E-06	2.60E-08	--	3.72E-10	N/A
	Offsite	Adult Resident	0-30	1.44E-06	N/A	N/A	1.52E-08	9.25E-08
	Offsite	Adult Resident	18-48	1.44E-06	2.60E-08	--	3.72E-10	2.27E-09
Chromium VI	Offsite	Child Resident	0- 5	4.26E-06	1.38E-06	--	1.98E-08	N/A
	Offsite	Child Resident	5-11	4.26E-06	1.12E-06	--	1.60E-08	N/A
	Offsite	Child Resident	11-18	4.26E-06	5.60E-07	--	8.00E-09	N/A
	Offsite	Adult Resident	18-30	4.26E-06	7.70E-08	--	1.10E-09	N/A
	Offsite	Adult Resident	0-30	4.26E-06	N/A	N/A	4.48E-08	1.88E-06
	Offsite	Adult Resident	18-48	4.26E-06	7.70E-08	--	1.10E-09	4.62E-08
Chrysene	Offsite	Child Resident	0- 5	1.50E-06	4.87E-07	--	6.95E-09	N/A
	Offsite	Child Resident	5-11	1.50E-06	3.94E-07	--	5.63E-09	N/A
	Offsite	Child Resident	11-18	1.50E-06	1.97E-07	--	2.82E-09	N/A
	Offsite	Adult Resident	18-30	1.50E-06	2.71E-08	--	3.87E-10	N/A
	Offsite	Adult Resident	0-30	1.50E-06	N/A	N/A	1.58E-08	9.63E-08
	Offsite	Adult Resident	18-48	1.50E-06	2.71E-08	--	3.87E-10	2.36E-09
Indeno(1,2,3-cd)pyrene	Offsite	Child Resident	0- 5	2.00E-06	6.49E-07	--	9.27E-09	N/A
	Offsite	Child Resident	5-11	2.00E-06	5.26E-07	--	7.51E-09	N/A
	Offsite	Child Resident	11-18	2.00E-06	2.63E-07	--	3.75E-09	N/A
	Offsite	Adult Resident	18-30	2.00E-06	3.62E-08	--	5.17E-10	N/A
	Offsite	Adult Resident	0-30	2.00E-06	N/A	N/A	2.11E-08	1.28E-07
	Offsite	Adult Resident	18-48	2.00E-06	3.62E-08	--	5.17E-10	3.15E-09

Table 4-41. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated Associated with Exposures from Inhalation of Dust in Outdoor Air - Offsite Residents During Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/m^3)	SDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Offsite	Child Resident	0- 5	3.04E-05	9.87E-06	--	1.41E-07	N/A
	Offsite	Child Resident	5-11	3.04E-05	7.99E-06	--	1.14E-07	N/A
	Offsite	Child Resident	11-18	3.04E-05	3.99E-06	--	5.71E-08	N/A
	Offsite	Adult Resident	18-30	3.04E-05	5.50E-07	--	7.85E-09	N/A
	Offsite	Adult Resident	0-30	3.04E-05	N/A	N/A	3.20E-07	--
	Offsite	Adult Resident	18-48	3.04E-05	5.50E-07	--	7.85E-09	--
Sum Total	Offsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Offsite	Child Resident	5-11	N/A	N/A	--	N/A	N/A
	Offsite	Child Resident	11-18	N/A	N/A	--	N/A	N/A
	Offsite	Adult Resident	18-30	N/A	N/A	--	N/A	N/A
	Offsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	4.09E-06
	Offsite	Adult Resident	18-48	N/A	N/A	--	N/A	1.00E-07

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-42. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Future Residents Post-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Arsenic	Onsite	Child Resident	0- 5	5.02E+00	6.73E-06	2.24E-02	4.81E-07	N/A
	Onsite	Child Resident	5- 9	5.02E+00	4.42E-06	1.47E-02	2.53E-07	N/A
	Onsite	Child Resident	0- 9	5.02E+00	N/A	N/A	7.33E-07	1.28E-06
	Onsite	Adult Resident	18-27	5.02E+00	1.57E-06	5.24E-03	2.02E-07	3.54E-07
Benzo(a)anthracene	Onsite	Child Resident	0- 5	9.80E-02	1.97E-06	--	1.41E-07	N/A
	Onsite	Child Resident	5- 9	9.80E-02	1.29E-06	--	7.40E-08	N/A
	Onsite	Child Resident	0- 9	9.80E-02	N/A	N/A	2.15E-07	1.24E-06
	Onsite	Adult Resident	18-27	9.80E-02	4.61E-07	--	5.92E-08	3.43E-07
Benzo(a)pyrene	Onsite	Child Resident	0- 5	9.60E-02	1.93E-06	--	1.38E-07	N/A
	Onsite	Child Resident	5- 9	9.60E-02	1.27E-06	--	7.25E-08	N/A
	Onsite	Child Resident	0- 9	9.60E-02	N/A	N/A	2.10E-07	1.22E-06
	Onsite	Adult Resident	18-27	9.60E-02	4.51E-07	--	5.80E-08	3.36E-07
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	1.03E-01	2.07E-06	--	1.48E-07	N/A
	Onsite	Child Resident	5- 9	1.03E-01	1.36E-06	--	7.77E-08	N/A
	Onsite	Child Resident	0- 9	1.03E-01	N/A	N/A	2.26E-07	1.31E-06
	Onsite	Adult Resident	18-27	1.03E-01	4.84E-07	--	6.22E-08	3.60E-07
Chromium VI	Onsite	Child Resident	0- 5	1.96E+00	2.63E-06	5.26E-04	1.88E-07	N/A
	Onsite	Child Resident	5- 9	1.96E+00	1.73E-06	3.45E-04	9.86E-08	N/A
	Onsite	Child Resident	0- 9	1.96E+00	N/A	N/A	2.86E-07	1.20E-07
	Onsite	Adult Resident	18-27	1.96E+00	6.14E-07	1.23E-04	7.89E-08	3.32E-08
Chrysene	Onsite	Child Resident	0- 5	1.13E-01	2.27E-06	--	1.62E-07	N/A
	Onsite	Child Resident	5- 9	1.13E-01	1.49E-06	--	8.53E-08	N/A
	Onsite	Child Resident	0- 9	1.13E-01	N/A	N/A	2.48E-07	1.43E-06
	Onsite	Adult Resident	18-27	1.13E-01	5.31E-07	--	6.83E-08	3.95E-07
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	1.61E-01	3.24E-06	--	2.31E-07	N/A
	Onsite	Child Resident	5- 9	1.61E-01	2.13E-06	--	1.22E-07	N/A
	Onsite	Child Resident	0- 9	1.61E-01	N/A	N/A	3.53E-07	2.04E-06
	Onsite	Adult Resident	18-27	1.61E-01	7.57E-07	--	9.73E-08	5.63E-07
Thallium	Onsite	Child Resident	0- 5	1.40E+01	1.88E-05	2.68E-01	1.34E-06	N/A
	Onsite	Child Resident	5- 9	1.40E+01	1.23E-05	1.76E-01	7.04E-07	N/A
	Onsite	Child Resident	0- 9	1.40E+01	N/A	N/A	2.05E-06	--
	Onsite	Adult Resident	18-27	1.40E+01	4.39E-06	6.27E-02	5.64E-07	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for dermal contact pathway and soil concentrations presented in Tables 4-11 and 4-12a.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-42. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Future Residents Post-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	2.91E-01	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	1.91E-01	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	8.64E-06
	Onsite	Adult Resident	18-27	N/A	N/A	6.81E-02	N/A	2.38E-06

Table 4-42. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Future Residents Post-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	5.02E+00	1.59E-05	5.29E-02	1.13E-06	N/A
	Onsite	Child Resident	5-11	5.02E+00	1.13E-05	3.76E-02	9.67E-07	N/A
	Onsite	Child Resident	11-18	5.02E+00	9.15E-06	3.05E-02	9.15E-07	N/A
	Onsite	Adult Resident	18-30	5.02E+00	3.91E-06	1.30E-02	6.70E-07	N/A
	Onsite	Adult Resident	0-30	5.02E+00	N/A	N/A	3.69E-06	6.45E-06
	Onsite	Adult Resident	18-48	5.02E+00	3.91E-06	1.30E-02	1.67E-06	2.93E-06
Benzo(a)anthracene	Onsite	Child Resident	0- 5	5.90E-01	2.80E-05	--	2.00E-06	N/A
	Onsite	Child Resident	5-11	5.90E-01	1.99E-05	--	1.71E-06	N/A
	Onsite	Child Resident	11-18	5.90E-01	1.61E-05	--	1.61E-06	N/A
	Onsite	Adult Resident	18-30	5.90E-01	6.89E-06	--	1.18E-06	N/A
	Onsite	Adult Resident	0-30	5.90E-01	N/A	N/A	6.50E-06	3.76E-05
	Onsite	Adult Resident	18-48	5.90E-01	6.89E-06	--	2.95E-06	1.71E-05
Benzo(a)pyrene	Onsite	Child Resident	0- 5	5.73E-01	2.72E-05	--	1.94E-06	N/A
	Onsite	Child Resident	5-11	5.73E-01	1.93E-05	--	1.66E-06	N/A
	Onsite	Child Resident	11-18	5.73E-01	1.57E-05	--	1.57E-06	N/A
	Onsite	Adult Resident	18-30	5.73E-01	6.69E-06	--	1.15E-06	N/A
	Onsite	Adult Resident	0-30	5.73E-01	N/A	N/A	6.31E-06	3.65E-05
	Onsite	Adult Resident	18-48	5.73E-01	6.69E-06	--	2.87E-06	1.66E-05
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	6.63E-01	3.15E-05	--	2.25E-06	N/A
	Onsite	Child Resident	5-11	6.63E-01	2.24E-05	--	1.92E-06	N/A
	Onsite	Child Resident	11-18	6.63E-01	1.81E-05	--	1.81E-06	N/A
	Onsite	Adult Resident	18-30	6.63E-01	7.74E-06	--	1.33E-06	N/A
	Onsite	Adult Resident	0-30	6.63E-01	N/A	N/A	7.30E-06	4.23E-05
	Onsite	Adult Resident	18-48	6.63E-01	7.74E-06	--	3.32E-06	1.92E-05
Chromium VI	Onsite	Child Resident	0- 5	1.96E+00	6.20E-06	1.24E-03	4.43E-07	N/A
	Onsite	Child Resident	5-11	1.96E+00	4.41E-06	8.81E-04	3.78E-07	N/A
	Onsite	Child Resident	11-18	1.96E+00	3.57E-06	7.15E-04	3.57E-07	N/A
	Onsite	Adult Resident	18-30	1.96E+00	1.53E-06	3.05E-04	2.61E-07	N/A
	Onsite	Adult Resident	0-30	1.96E+00	N/A	N/A	1.44E-06	6.04E-07
	Onsite	Adult Resident	18-48	1.96E+00	1.53E-06	3.05E-04	6.54E-07	2.75E-07
Chrysene	Onsite	Child Resident	0- 5	6.88E-01	3.26E-05	--	2.33E-06	N/A
	Onsite	Child Resident	5-11	6.88E-01	2.32E-05	--	1.99E-06	N/A
	Onsite	Child Resident	11-18	6.88E-01	1.88E-05	--	1.88E-06	N/A
	Onsite	Adult Resident	18-30	6.88E-01	8.03E-06	--	1.38E-06	N/A
	Onsite	Adult Resident	0-30	6.88E-01	N/A	N/A	7.58E-06	4.39E-05
	Onsite	Adult Resident	18-48	6.88E-01	8.03E-06	--	3.44E-06	1.99E-05
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	9.20E-01	4.36E-05	--	3.12E-06	N/A
	Onsite	Child Resident	5-11	9.20E-01	3.10E-05	--	2.66E-06	N/A
	Onsite	Child Resident	11-18	9.20E-01	2.52E-05	--	2.52E-06	N/A
	Onsite	Adult Resident	18-30	9.20E-01	1.07E-05	--	1.84E-06	N/A
	Onsite	Adult Resident	0-30	9.20E-01	N/A	N/A	1.01E-05	5.87E-05
	Onsite	Adult Resident	18-48	9.20E-01	1.07E-05	--	4.60E-06	2.66E-05

Table 4-42. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Dermal Contact with Soil - Future Residents Post-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Onsite	Child Resident	0- 5	1.40E+01	4.43E-05	6.33E-01	3.16E-06	N/A
	Onsite	Child Resident	5-11	1.40E+01	3.15E-05	4.50E-01	2.70E-06	N/A
	Onsite	Child Resident	11-18	1.40E+01	2.55E-05	3.65E-01	2.55E-06	N/A
	Onsite	Adult Resident	18-30	1.40E+01	1.09E-05	1.56E-01	1.87E-06	N/A
	Onsite	Adult Resident	0-30	1.40E+01	N/A	N/A	1.03E-05	--
	Onsite	Adult Resident	18-48	1.40E+01	1.09E-05	1.56E-01	4.67E-06	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	6.87E-01	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	4.88E-01	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	3.96E-01	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	1.69E-01	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	2.26E-04
	Onsite	Adult Resident	18-48	N/A	N/A	1.69E-01	N/A	1.03E-04

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-43. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Future Residents Post-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	5.02E+00	7.41E-05	2.47E-01	5.29E-06	N/A
	Onsite	Child Resident	5- 9	5.02E+00	2.01E-05	6.69E-02	1.15E-06	N/A
	Onsite	Child Resident	0- 9	5.02E+00	N/A	N/A	6.44E-06	1.13E-05
	Onsite	Adult Resident	18-27	5.02E+00	6.88E-06	2.29E-02	8.84E-07	1.55E-06
Benzo(a)anthracene	Onsite	Child Resident	0- 5	9.80E-02	1.45E-06	--	1.03E-07	N/A
	Onsite	Child Resident	5- 9	9.80E-02	3.92E-07	--	2.24E-08	N/A
	Onsite	Child Resident	0- 9	9.80E-02	N/A	N/A	1.26E-07	7.27E-07
	Onsite	Adult Resident	18-27	9.80E-02	1.34E-07	--	1.73E-08	9.99E-08
Benzo(a)pyrene	Onsite	Child Resident	0- 5	9.60E-02	1.42E-06	--	1.01E-07	N/A
	Onsite	Child Resident	5- 9	9.60E-02	3.84E-07	--	2.19E-08	N/A
	Onsite	Child Resident	0- 9	9.60E-02	N/A	N/A	1.23E-07	7.13E-07
	Onsite	Adult Resident	18-27	9.60E-02	1.32E-07	--	1.69E-08	9.79E-08
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	1.03E-01	1.52E-06	--	1.09E-07	N/A
	Onsite	Child Resident	5- 9	1.03E-01	4.12E-07	--	2.35E-08	N/A
	Onsite	Child Resident	0- 9	1.03E-01	N/A	N/A	1.32E-07	7.65E-07
	Onsite	Adult Resident	18-27	1.03E-01	1.41E-07	--	1.81E-08	1.05E-07
Chromium VI	Onsite	Child Resident	0- 5	1.96E+00	2.89E-05	5.78E-03	2.07E-06	N/A
	Onsite	Child Resident	5- 9	1.96E+00	7.83E-06	1.57E-03	4.47E-07	N/A
	Onsite	Child Resident	0- 9	1.96E+00	N/A	N/A	2.51E-06	1.06E-06
	Onsite	Adult Resident	18-27	1.96E+00	2.68E-06	5.37E-04	3.45E-07	1.45E-07
Chrysene	Onsite	Child Resident	0- 5	1.13E-01	1.67E-06	--	1.19E-07	N/A
	Onsite	Child Resident	5- 9	1.13E-01	4.51E-07	--	2.58E-08	N/A
	Onsite	Child Resident	0- 9	1.13E-01	N/A	N/A	1.45E-07	8.39E-07
	Onsite	Adult Resident	18-27	1.13E-01	1.55E-07	--	1.99E-08	1.15E-07
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	1.61E-01	2.38E-06	--	1.70E-07	N/A
	Onsite	Child Resident	5- 9	1.61E-01	6.43E-07	--	3.68E-08	N/A
	Onsite	Child Resident	0- 9	1.61E-01	N/A	N/A	2.06E-07	1.20E-06
	Onsite	Adult Resident	18-27	1.61E-01	2.21E-07	--	2.84E-08	1.64E-07
Thallium	Onsite	Child Resident	0- 5	1.40E+01	2.07E-04	2.95E+00	1.48E-05	N/A
	Onsite	Child Resident	5- 9	1.40E+01	5.59E-05	7.99E-01	3.20E-06	N/A
	Onsite	Child Resident	0- 9	1.40E+01	N/A	N/A	1.79E-05	--
	Onsite	Adult Resident	18-27	1.40E+01	1.92E-05	2.74E-01	2.47E-06	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for ingestion pathway and soil concentrations presented in Tables 4-11 and 4-13.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Table 4-43. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Future Residents Post-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	3.20E+00	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	8.67E-01	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	1.66E-05
	Onsite	Adult Resident	18-27	N/A	N/A	2.97E-01	N/A	2.28E-06

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-43. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Future Residents Post-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	5.02E+00	7.41E-05	2.47E-01	5.29E-06	N/A
	Onsite	Child Resident	5-11	5.02E+00	1.78E-05	5.94E-02	1.53E-06	N/A
	Onsite	Child Resident	11-18	5.02E+00	8.91E-06	2.97E-02	8.91E-07	N/A
	Onsite	Adult Resident	18-30	5.02E+00	6.88E-06	2.29E-02	1.18E-06	N/A
	Onsite	Adult Resident	0-30	5.02E+00	N/A	N/A	8.89E-06	1.56E-05
	Onsite	Adult Resident	18-48	5.02E+00	6.88E-06	2.29E-02	2.95E-06	5.16E-06
Benzo(a)anthracene	Onsite	Child Resident	0- 5	5.90E-01	8.70E-06	--	6.22E-07	N/A
	Onsite	Child Resident	5-11	5.90E-01	2.10E-06	--	1.80E-07	N/A
	Onsite	Child Resident	11-18	5.90E-01	1.05E-06	--	1.05E-07	N/A
	Onsite	Adult Resident	18-30	5.90E-01	8.08E-07	--	1.39E-07	N/A
	Onsite	Adult Resident	0-30	5.90E-01	N/A	N/A	1.04E-06	6.05E-06
	Onsite	Adult Resident	18-48	5.90E-01	8.08E-07	--	3.46E-07	2.01E-06
Benzo(a)pyrene	Onsite	Child Resident	0- 5	5.73E-01	8.45E-06	--	6.04E-07	N/A
	Onsite	Child Resident	5-11	5.73E-01	2.04E-06	--	1.74E-07	N/A
	Onsite	Child Resident	11-18	5.73E-01	1.02E-06	--	1.02E-07	N/A
	Onsite	Adult Resident	18-30	5.73E-01	7.85E-07	--	1.35E-07	N/A
	Onsite	Adult Resident	0-30	5.73E-01	N/A	N/A	1.01E-06	5.87E-06
	Onsite	Adult Resident	18-48	5.73E-01	7.85E-07	--	3.36E-07	1.95E-06
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	6.63E-01	9.78E-06	--	6.99E-07	N/A
	Onsite	Child Resident	5-11	6.63E-01	2.35E-06	--	2.02E-07	N/A
	Onsite	Child Resident	11-18	6.63E-01	1.18E-06	--	1.18E-07	N/A
	Onsite	Adult Resident	18-30	6.63E-01	9.08E-07	--	1.56E-07	N/A
	Onsite	Adult Resident	0-30	6.63E-01	N/A	N/A	1.17E-06	6.80E-06
	Onsite	Adult Resident	18-48	6.63E-01	9.08E-07	--	3.89E-07	2.25E-06
Chromium VI	Onsite	Child Resident	0- 5	1.96E+00	2.89E-05	5.78E-03	2.07E-06	N/A
	Onsite	Child Resident	5-11	1.96E+00	6.96E-06	1.39E-03	5.97E-07	N/A
	Onsite	Child Resident	11-18	1.96E+00	3.48E-06	6.96E-04	3.48E-07	N/A
	Onsite	Adult Resident	18-30	1.96E+00	2.68E-06	5.37E-04	4.60E-07	N/A
	Onsite	Adult Resident	0-30	1.96E+00	N/A	N/A	3.47E-06	1.46E-06
	Onsite	Adult Resident	18-48	1.96E+00	2.68E-06	5.37E-04	1.15E-06	4.83E-07
Chrysene	Onsite	Child Resident	0- 5	6.88E-01	1.01E-05	--	7.25E-07	N/A
	Onsite	Child Resident	5-11	6.88E-01	2.44E-06	--	2.09E-07	N/A
	Onsite	Child Resident	11-18	6.88E-01	1.22E-06	--	1.22E-07	N/A
	Onsite	Adult Resident	18-30	6.88E-01	9.42E-07	--	1.62E-07	N/A
	Onsite	Adult Resident	0-30	6.88E-01	N/A	N/A	1.22E-06	7.05E-06
	Onsite	Adult Resident	18-48	6.88E-01	9.42E-07	--	4.04E-07	2.34E-06
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	9.20E-01	1.36E-05	--	9.69E-07	N/A
	Onsite	Child Resident	5-11	9.20E-01	3.27E-06	--	2.80E-07	N/A
	Onsite	Child Resident	11-18	9.20E-01	1.63E-06	--	1.63E-07	N/A
	Onsite	Adult Resident	18-30	9.20E-01	1.26E-06	--	2.16E-07	N/A
	Onsite	Adult Resident	0-30	9.20E-01	N/A	N/A	1.63E-06	9.43E-06
	Onsite	Adult Resident	18-48	9.20E-01	1.26E-06	--	5.40E-07	3.13E-06

Table 4-43. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Ingestion of Soil - Future Residents Post-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/kg)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Onsite	Child Resident	0- 5	1.40E+01	2.07E-04	2.95E+00	1.48E-05	N/A
	Onsite	Child Resident	5-11	1.40E+01	4.97E-05	7.10E-01	4.26E-06	N/A
	Onsite	Child Resident	11-18	1.40E+01	2.49E-05	3.55E-01	2.49E-06	N/A
	Onsite	Adult Resident	18-30	1.40E+01	1.92E-05	2.74E-01	3.29E-06	N/A
	Onsite	Adult Resident	0-30	1.40E+01	N/A	N/A	2.48E-05	--
	Onsite	Adult Resident	18-48	1.40E+01	1.92E-05	2.74E-01	8.22E-06	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	3.20E+00	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	7.71E-01	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	3.85E-01	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	2.97E-01	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	5.23E-05
	Onsite	Adult Resident	18-48	N/A	N/A	2.97E-01	N/A	1.73E-05

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-44. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Future Residents Post-Construction Scenario /a/

				AVERAGE SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Arsenic	Onsite	Child Resident	0- 5	2.64E-07	2.11E-07	--	1.51E-08	N/A
	Onsite	Child Resident	5- 9	2.64E-07	1.40E-07	--	8.01E-09	N/A
	Onsite	Child Resident	0- 9	2.64E-07	N/A	N/A	2.31E-08	3.48E-07
	Onsite	Adult Resident	18-27	2.64E-07	3.74E-08	--	4.80E-09	7.25E-08
Benzo(a)anthracene	Onsite	Child Resident	0- 5	5.15E-09	4.11E-09	--	2.94E-10	N/A
	Onsite	Child Resident	5- 9	5.15E-09	2.73E-09	--	1.56E-10	N/A
	Onsite	Child Resident	0- 9	5.15E-09	N/A	N/A	4.50E-10	2.74E-09
	Onsite	Adult Resident	18-27	5.15E-09	7.29E-10	--	9.37E-11	5.72E-10
Benzo(a)pyrene	Onsite	Child Resident	0- 5	5.04E-09	4.02E-09	--	2.87E-10	N/A
	Onsite	Child Resident	5- 9	5.04E-09	2.67E-09	--	1.53E-10	N/A
	Onsite	Child Resident	0- 9	5.04E-09	N/A	N/A	4.40E-10	2.69E-09
	Onsite	Adult Resident	18-27	5.04E-09	7.13E-10	--	9.17E-11	5.59E-10
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	5.41E-09	4.32E-09	--	3.09E-10	N/A
	Onsite	Child Resident	5- 9	5.41E-09	2.87E-09	--	1.64E-10	N/A
	Onsite	Child Resident	0- 9	5.41E-09	N/A	N/A	4.73E-10	2.88E-09
	Onsite	Adult Resident	18-27	5.41E-09	7.66E-10	--	9.84E-11	6.01E-10
Chromium VI	Onsite	Child Resident	0- 5	1.03E-07	8.22E-08	--	5.87E-09	N/A
	Onsite	Child Resident	5- 9	1.03E-07	5.47E-08	--	3.12E-09	N/A
	Onsite	Child Resident	0- 9	1.03E-07	N/A	N/A	9.00E-09	3.78E-07
	Onsite	Adult Resident	18-27	1.03E-07	1.46E-08	--	1.87E-09	7.87E-08
Chrysene	Onsite	Child Resident	0- 5	5.93E-09	4.73E-09	--	3.38E-10	N/A
	Onsite	Child Resident	5- 9	5.93E-09	3.15E-09	--	1.80E-10	N/A
	Onsite	Child Resident	0- 9	5.93E-09	N/A	N/A	5.18E-10	3.16E-09
	Onsite	Adult Resident	18-27	5.93E-09	8.39E-10	--	1.08E-10	6.58E-10
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	8.45E-09	6.75E-09	--	4.82E-10	N/A
	Onsite	Child Resident	5- 9	8.45E-09	4.48E-09	--	2.56E-10	N/A
	Onsite	Child Resident	0- 9	8.45E-09	N/A	N/A	7.38E-10	4.50E-09
	Onsite	Adult Resident	18-27	8.45E-09	1.20E-09	--	1.54E-10	9.38E-10
Thallium	Onsite	Child Resident	0- 5	7.35E-07	5.87E-07	--	4.19E-08	N/A
	Onsite	Child Resident	5- 9	7.35E-07	3.90E-07	--	2.23E-08	N/A
	Onsite	Child Resident	0- 9	7.35E-07	N/A	N/A	6.42E-08	--
	Onsite	Adult Resident	18-27	7.35E-07	1.04E-07	--	1.34E-08	--

/a/ See text for explanation.
/b/ Noncarcinogenic and carcinogenic chronic daily intake (CDIn, CDIc) dose calculated based on intake assumptions for inhalation of dust pathway and air concentrations presented in Tables 4-11 and 4-15.
/c/ HQ = Hazard Quotient (Dose/cRfD); used to evaluate noncarcinogenic effects.
/d/ Risk = Carcinogenic Slope Factor x Dose; used to evaluate carcinogenic effects.
Notes:
N/A = Not applicable
Dashes (--) = Not calculable

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table 4-44. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Future Residents Post-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	AVERAGE SCENARIO Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	5- 9	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	0- 9	N/A	N/A	N/A	N/A	7.42E-07
	Onsite	Adult Resident	18-27	N/A	N/A	--	N/A	1.55E-07

Table 4-44. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Future Residents Post-Construction Scenario /a/

Chemical	Location	Receptor	Age (years)	REASONABLE MAXIMUM SCENARIO Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/ -
Arsenic	Onsite	Child Resident	0- 5	2.64E-07	2.87E-07	--	2.05E-08	N/A
	Onsite	Child Resident	5-11	2.64E-07	1.89E-07	--	1.62E-08	N/A
	Onsite	Child Resident	11-18	2.64E-07	9.53E-08	--	9.53E-09	N/A
	Onsite	Adult Resident	18-30	2.64E-07	5.28E-08	--	9.05E-09	N/A
	Onsite	Adult Resident	0-30	2.64E-07	N/A	N/A	5.53E-08	8.35E-07
	Onsite	Adult Resident	18-48	2.64E-07	5.28E-08	--	2.26E-08	3.42E-07
Benzo(a)anthracene	Onsite	Child Resident	0- 5	3.10E-08	3.38E-08	--	2.41E-09	N/A
	Onsite	Child Resident	5-11	3.10E-08	2.22E-08	--	1.90E-09	N/A
	Onsite	Child Resident	11-18	3.10E-08	1.12E-08	--	1.12E-09	N/A
	Onsite	Adult Resident	18-30	3.10E-08	6.20E-09	--	1.06E-09	N/A
	Onsite	Adult Resident	0-30	3.10E-08	N/A	N/A	6.50E-09	3.96E-08
	Onsite	Adult Resident	18-48	3.10E-08	6.20E-09	--	2.66E-09	1.62E-08
Benzo(a)pyrene	Onsite	Child Resident	0- 5	3.01E-08	3.28E-08	--	2.34E-09	N/A
	Onsite	Child Resident	5-11	3.01E-08	2.16E-08	--	1.85E-09	N/A
	Onsite	Child Resident	11-18	3.01E-08	1.09E-08	--	1.09E-09	N/A
	Onsite	Adult Resident	18-30	3.01E-08	6.02E-09	--	1.03E-09	N/A
	Onsite	Adult Resident	0-30	3.01E-08	N/A	N/A	6.31E-09	3.85E-08
	Onsite	Adult Resident	18-48	3.01E-08	6.02E-09	--	2.58E-09	1.57E-08
Benzo(k)fluoranthene	Onsite	Child Resident	0- 5	3.48E-08	3.79E-08	--	2.71E-09	N/A
	Onsite	Child Resident	5-11	3.48E-08	2.49E-08	--	2.14E-09	N/A
	Onsite	Child Resident	11-18	3.48E-08	1.26E-08	--	1.26E-09	N/A
	Onsite	Adult Resident	18-30	3.48E-08	6.96E-09	--	1.19E-09	N/A
	Onsite	Adult Resident	0-30	3.48E-08	N/A	N/A	7.29E-09	4.45E-08
	Onsite	Adult Resident	18-48	3.48E-08	6.96E-09	--	2.98E-09	1.82E-08
Chromium VI	Onsite	Child Resident	0- 5	1.03E-07	1.12E-07	--	8.01E-09	N/A
	Onsite	Child Resident	5-11	1.03E-07	7.38E-08	--	6.32E-09	N/A
	Onsite	Child Resident	11-18	1.03E-07	3.72E-08	--	3.72E-09	N/A
	Onsite	Adult Resident	18-30	1.03E-07	2.06E-08	--	3.53E-09	N/A
	Onsite	Adult Resident	0-30	1.03E-07	N/A	N/A	2.16E-08	9.07E-07
	Onsite	Adult Resident	18-48	1.03E-07	2.06E-08	--	8.83E-09	3.71E-07
Chrysene	Onsite	Child Resident	0- 5	3.61E-08	3.93E-08	--	2.81E-09	N/A
	Onsite	Child Resident	5-11	3.61E-08	2.59E-08	--	2.22E-09	N/A
	Onsite	Child Resident	11-18	3.61E-08	1.30E-08	--	1.30E-09	N/A
	Onsite	Adult Resident	18-30	3.61E-08	7.22E-09	--	1.24E-09	N/A
	Onsite	Adult Resident	0-30	3.61E-08	N/A	N/A	7.57E-09	4.61E-08
	Onsite	Adult Resident	18-48	3.61E-08	7.22E-09	--	3.09E-09	1.89E-08
Indeno(1,2,3-cd)pyrene	Onsite	Child Resident	0- 5	4.83E-08	5.26E-08	--	3.76E-09	N/A
	Onsite	Child Resident	5-11	4.83E-08	3.46E-08	--	2.97E-09	N/A
	Onsite	Child Resident	11-18	4.83E-08	1.74E-08	--	1.74E-09	N/A
	Onsite	Adult Resident	18-30	4.83E-08	9.66E-09	--	1.66E-09	N/A
	Onsite	Adult Resident	0-30	4.83E-08	N/A	N/A	1.01E-08	6.17E-08
	Onsite	Adult Resident	18-48	4.83E-08	9.66E-09	--	4.14E-09	2.52E-08

Table 4-44. Estimation of Carcinogenic Health Risks and Noncarcinogenic Adverse Health Effects Associated with Exposures from Inhalation of Dust in Indoor Air - Future Residents Post-Construction Scenario /a/

				REASONABLE MAXIMUM SCENARIO				
Chemical	Location	Receptor	Age (years)	Conc. (mg/m^3)	CDIn /b/ (mg/kg/day)	HQ /c/	CDIc /b/ (mg/kg/day)	RISK /d/
Thallium	Onsite	Child Resident	0- 5	7.35E-07	8.00E-07	--	5.72E-08	N/A
	Onsite	Child Resident	5-11	7.35E-07	5.27E-07	--	4.51E-08	N/A
	Onsite	Child Resident	11-18	7.35E-07	2.65E-07	--	2.65E-08	N/A
	Onsite	Adult Resident	18-30	7.35E-07	1.47E-07	--	2.52E-08	N/A
	Onsite	Adult Resident	0-30	7.35E-07	N/A	N/A	1.54E-07	--
	Onsite	Adult Resident	18-48	7.35E-07	1.47E-07	--	6.30E-08	--
Sum Total	Onsite	Child Resident	0- 5	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	5-11	N/A	N/A	--	N/A	N/A
	Onsite	Child Resident	11-18	N/A	N/A	--	N/A	N/A
	Onsite	Adult Resident	18-30	N/A	N/A	--	N/A	N/A
	Onsite	Adult Resident	0-30	N/A	N/A	N/A	N/A	1.97E-06
	Onsite	Adult Resident	18-48	N/A	N/A	--	N/A	8.07E-07

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Appendix E

METHODS USED FOR ESTIMATING EXPOSURE POINT CONCENTRATIONS IN AIR

TABLE OF CONTENTS

1.0	DUST EMISSION FACTOR	E-1
2.0	VAPOR EMISSIONS	E-3
3.0	AIR DISPERSION MODEL FOR DUST	E-7
	3.1 Box Model	E-7
	3.2 Fugitive Dust Model (FDM)	E-8

LIST OF TABLES

Table E-1 Vapor Emission Rate of carcinogenic cPNAs Modeled as Benzo(a)pyrene, During Construction Scenario

Table E-2 Onsite Dust Air Concentrations for Construction Worker, During Construction Scenario

Table E-3 Estimated Dust Air Concentrations Based on FDM, During Construction Scenario

1.0 DUST EMISSION FACTOR

During the construction stage of site development, dusts will be generated as a result of activities such as excavation, soil loading and unloading, and heavy vehicle movement on bare soil areas. Wind erosion of both the uncovered site or excavation pit itself and the stored piles of excavated site soils can also be expected.

In order to estimate levels of suspended dusts at sites (both on- and offsite) due to construction activities, the dust emission rate, generally expressed in units of grams per square meter per second (g/m^2-sec), must be obtained. The dust emission rate is coupled with an air dispersion model, which takes site dimensions and meteorology (e.g., winds) into account to estimate a site-specific unit air concentration in milligrams per cubic meter (mg/m^3). The unit air concentration is used to estimate chemical-specific air concentrations by multiplying the unit dust air concentration by the chemical concentration in soil.

Cowherd et al. (*1974*) contains information that was used to obtain a generic and conservative dust emission rate for construction operations at sites. In Cowherd et al. (*1974*), actual dust air concentrations were measured over extended periods for two construction sites in two arid parts of the western United States, Phoenix, Arizona and Las Vegas, Nevada.

The measurements represent dusts generated during construction at arid sites without containment methods, with the exception of some intermittently applied water spraying during periods of unusual and visible dust generation. The Phoenix construction site was an 80-acre future shopping center referred to as the "Paradise Valley" project. Three dust concentrations were obtained from air measurements at three sampling stations downwind of the site. Sampling periods corresponded to periods

of heavy construction activity such as excavation and batch dropping of soils. The average dust concentration, 366 $\mu g/m^3$, was then used to back-calculate the source strength using an air dispersion model; this resulted in an average dust emission factor of 1.4 tons per acre per month (T/ac-mo). Another sampling period resulted in a dust emission factor of 1.0 T/ac-mo (*Cowherd et al., 1974*).

Using this same approach for the Las Vegas site, dust emission factors of 1.0 and 1.8 T/ac-mo were estimated for two sampling periods. Although not explicitly stated, the Las Vegas measurements were likely also obtained during periods of heavy construction activity. Because these determinations of the dust emission factor were made using the same approach, it is reasonable to average the values of 1.4, 1.0, 1.0 and 1.8 T/ac-mo to obtain a representative value of 1.3 T/ac-mo for use in evaluating general construction scenarios in this report.

This dust emission factor of 1.3 T/ac-mo (0.113 mg/m^2-sec) was used in combination with a site-specific air dispersion box model to estimate the respirable dust concentrations in outdoor air at 1009 Mission Street, assuming a standard construction scenario involving trenching, backhoeing, scraping, batch-drop operations, etc. Because the measurements by Cowherd et al. (*1974*) were obtained under hot, dry conditions involving heavy construction activities, the factor of 1.3 T/ac-mo is considered to be conservative.

The value of 1.3 T/ac-mo (0.113 milligrams per square centimeters per second [mg/m^2-sec]) was used for 1009 Mission Street in combination with site-specific air dispersion models to calculate chemical concentrations of dust in air. Section 3.0 details the methods and assumptions used in these dispersion models.

2.0 VAPOR EMISSIONS

In order to estimate the rate of vapor emissions due to the most volatile of the COCs detected at the site (carcinogenic cPNAs), the following assessment was performed.

First, the lesser of the 95% UCL of the arithmetic mean and of the maximum detected soil concentrations for each of the five carcinogenic cPNAs selected as COCs were totaled. This total carcinogenic cPNA soil concentration was then modeled using Shen's soil volatilization model (*Shen, 1981*) and chemical-specific input parameters for B(a)P.

$$Q = D_i C_{air} P_t^{4/3} A\ Wi/L \qquad \text{(Equation E-3)}$$

where:

Q = Emission rate (g/sec)

D_i = Diffusion coefficient (cm^2/sec);

C_{air} = Vapor phase concentration (mg/m^3);

P_t = Soil porosity (dimensionless);

A = Area source (cm^2);

L = Depth of soil cover (cm);

Wi = Weight fraction of chemical in soil (dimensionless)

where:

$$C_{air} = \frac{P_i MW_i}{RT} \qquad \text{(Equation E-4)}$$

Pi = vapor pressure of chemical; (mmHg)

MWi = molecular weight of chemical; (g/mole)

R = gas constant = 62,300 mmHg -cm^3/°K-mole

T = temperature of soil or air (°K)

C_{air} represents the air concentration within the soil pores of the unsaturated zone to the air soil interface. Q represents the emission rate (also known as E) at which a chemical is expected to diffuse through the soil to the air, thereby contributing to ambient air concentrations. Absorption to the soil surface, leaching, and biodegradation are not considered in the equation. The result of Shen's model is a vapor emission rate of 7.88×10^{-13} grams per second (g/sec), as shown on Table E-1.

Because construction activities are known to increase vapor emissions of chemical present in soil (*EPA, 1989a*), this base soil vapor emission rate of 7.88×10^{-13} g/sec must be upwardly adjusted. EPA recommends the use of agitation factors (AFs) to account for this increase in vapor emissions due to soil handling operations (*EPA, 1989a*). These AFs range from 2.5 to 72, depending on the type of activity. This 2.5 to 72 range includes the following types of operations:

- Excavation with backhoe or bulldozer
- Dumping
- Short-term storage
- Grading

These activities are planned during development of the Mission Street site. Therefore, it is reasonable to use the average of this range, 37, as an appropriate value for the AF parameter for activities at the Mission Street site. Multiplying the base emission rate, by this AF gives an adjusted emission rate (Q') of 1.18×10^{-11} g/sec. Table E-1 shows the Shen model input parameters used in this assessment.

Q' is then input into a second model, a "box"-type air dispersion model, to calculate an air concentration of total carcinogenic cPNA vapors over the immediate vicinity of the site; the area expected to generate the highest vapor concentrations. The

box model applied is that of Dobbins (*1979*), as described in Section 3.1 of this Appendix for estimating onsite air dust concentrations, with a few modifications. These modifications are due to the emission rate being in g/sec versus mg/m^2-sec. The equation is as follows:

$$Ci = \frac{Q'wCF}{HUA} \qquad \text{(Equation E-5)}$$

where:

- Ci = Onsite vapor air concentration (mg/m^3)
- Q' = Adjusted emission rate (g/sec)
- w = Width of source area (m)
- CF = Conversion factor, 1000 mg/g
- H = Height of box (m)
- U = Wind speed (m/sec)
- A = Source area (m^2).

Site dimensions used to select parameters for the box model were obtained from measurements of the site, according to the site maps (Plate 2), to determine the area source of 1439 m^2. A value of 2.0 was used for the mixing height, which is the recommended default value from EPA for screening purposes (*EPA, 1991*). The wind speed employed, 4.7 meters per second (m/sec), is the annual average wind speed recorded at the San Francisco International Airport, which is expected to be a good approximation of the wind speed at the site.

As shown on Table E-1, an onsite vapor air concentration of 1.18×10^{-10} mg/m^3 was obtained. This air concentration was then used to estimate a carcinogenic risk,

using intake assumptions and the equation listed in Table 4-10 for dust inhalation exposures to onsite construction workers. Multiplying the inhalation SF (Table 4-5b) for B(a)P of 6.1 $(mg/kg\text{-}day)^{-1}$ results in a risk of 1×10^{-13}. As discussed in Section 4.5, this risk estimate of 1×10^{-13} is well below the target risk level of 1×10^{-5} and 1×10^{-4} to 1×10^{-6} recommended by Cal-EPA and EPA, respectively.

3.0 AIR DISPERSION MODEL FOR DUST

The following sections describe the dispersion models used to estimate on- and offsite air concentrations. These dispersion models were used in conjunction with the models previously described.

3.1 Box Model

The box model described by Dobbins (*1979*) was used to predict onsite concentrations of dust for onsite construction workers, as follows, using the dust emission factor of 0.113 mg/m^2-sec described in Section 1.0:

$$Ci = \frac{E\,w}{H\,U} \qquad \text{(Equation E-1)}$$

where:

Ci = Onsite dust air concentration (mg/m^3)

E = Dust emission rate (mg/m^2-sec; 0.113)

w = Width of the source area (m)

H = Height of box, or "mixing height" (m)

U = Wind speed (m/sec).

The box model is a conservative air dispersion model and assumes that an individual will always be located directly on top of the chemical emissions source. For individuals located some distance from the emissions source, wind meander and other meteorological effects will likely result in air concentrations of chemicals significantly less than those estimated from a "box model". For the purposes of this assessment, a mixing height of 2.0 m was used, consistent with EPA guidelines for conservative screening level calculations (*EPA, 1991*). Table E-2 shows the parameters values used in

the box model used to estimate onsite air dust concentrations. A final dust air concentration of 0.715 mg/m^3 is obtained.

3.2 Fugitive Dust Model (FDM)

The Fugitive Dust Model (FDM) is a model used for estimating offsite downwind air and deposition concentrations of chemicals adsorbed to dust particles that become entrained in the atmosphere due to agitation of surface soils. This description focuses on factors influencing calculated air concentrations; Appendix F discusses methods used in the FDM to calculate deposition. The FDM is based upon the work of Sehmel and Hodgson (*1978*). For both the estimation of air concentrations and deposition, the user must specify a point (or points) a certain distance from the fugitive dust source. The model is generally based on the standard Gaussian plume dispersion formulation for computing downwind concentrations, but has been specifically adapted to incorporate an improved gradient transfer deposition algorithm based on the equations of Ermak (*1977*). The FDM was shown in three major validation studies to be an appropriate model in predicting impacts from fugitive dust sources and was judged to be superior to the Industrial Source Complex models for fugitive dust sources (*EPA, 1990b*). In the FDM, the dust emission factor previously described in this appendix (0.113 mg/m^3) was used as input for the model to represent onsite dust emissions.

The general equation governing the transport and dispersion of uniformly sized pollutant particles in the atmosphere used by the FDM to calculate air concentrations of dust is as follows:

$$\frac{\partial \chi}{\partial t} = \frac{\partial}{\partial x} K_x \frac{\partial \chi}{\partial x} - U \frac{\partial \chi}{\partial x} + \frac{\partial}{\partial y} K_y \frac{\partial \chi}{\partial y} + \frac{\partial}{\partial z} K_z \frac{\partial \chi}{\partial z} + V_g \frac{\partial \chi}{\partial z}$$

(Equation E-6)

where:

χ = Concentration in grams per cubic meter (g/m^3)

t = Time (sec)

K_x K_y K_z = Eddy diffusivity in the x, y, and z directions (m^2/sec)

x, y, z = Coordinates in three dimensional space

U = Wind speed (m/sec)

V_g = Gravitational settling velocity (m/sec).

To solve this equation, several assumptions must be made. First, the diffusion in the x direction is assumed to be small compared with the advection by the wind speed in that direction. Secondly, the eddy diffusivities are assumed to be functions only of downwind distance. With the further assumptions that the eddy diffusivity must be constant for all space and time and that mass should be conserved, the equation can be written in a form that can be solved to provide estimates of airborne pollutant concentrations.

Key inputs to the FDM are the roughness height and friction velocity. Both the roughness height and friction velocity define the turbulence the airborne dust plume encounters during migration away from the source area, and therefore affect both calculated dust air concentrations and deposited soil concentrations. The roughness height was assumed to be 2 m for 1028 Howard Street per the recommendations of the FDM User's Guide (*EPA, 1990b*) for buildings or other large structures in close proximity to the area emission source. Friction velocities are calculated internally in the FDM from the wind speed and the height at which the meteorological data were collected, based upon the computer program of McRae (*1977*). Meteorological data input to the FDM were obtained from the San Francisco International Airport for the years 1960-1978 and were input to the model in a STAR or joint-frequency distribution

format; an average windspeed of 4.7 m/sec was used. The dust emission rate was taken from Section 1.0 of this appendix, 0.113 mg/m^2-sec.

The FDM outputs are presented as an attachment at the end of Appendix F. Table E-3 presents the unit air concentrations from FDM for offsite receptors and the weight fraction of soil concentrations for average and RME scenarios. The values from the FDM output in Appendix F and column two of Table E-3 differ by a factor of two because of a dust suppression factor of 0.5 was removed from the dust emission rate used in the FDM. Because the relationship between emission rate and final concentration is linear, the results of the FDM are multiplied by 2 and placed in Table E-3. The first two columns of information in Table E-3 are multiplied to result in an air chemical concentration for offsite receptors for risk characterization (shown in the third column).

References

Cowherd, Jr., C., K. Axetell, Jr., C.M. Guenther, and G.A. Jutze, 1974. *Development of Emission Factors for Fugitive Dust Sources.* Prepared for U.S. Environmental Protection Agency, Office of Air Quality and Waste Management, Research Triangle Park, North Carolina, EPA-450/3-74-037. June.

Dobbins, R.A., 1979. *Atmospheric Motion and Air Pollution.* New York; John Wiley. p. 275.

Ermak, D.L., 1977. *An Analytical Model for Air Pollutant Transport and Deposition from a Point Source.* Atmospheric Environment 11:231-237.

McRae, G.J., 1977. *Computer Program for Calculation of the Friction Velocity.* Environmental Laboratory, 206-40, California Institute of Technology, Pasadena, California.

Sehmel, G.A. and W.H. Hodgson, 1978. *Model for Predicting Dry Deposition of Particles and Gases to Environmental Surfaces.* PNL-SA-6721, Battelle Pacific Northwest Laboratories, Richland, Washington.

Shen, T., 1981. *Estimating Hazardous Air Emissions from Disposal Sites.* Poll. Eng. 13 (8):31-34.

U.S. Environmental Protection Agency (EPA), 1986. *Superfund Public Health Evaluation Manual.* Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-86/060. October.

______, 1989a. *Air/Superfund National Technical Guidance Study Series. Volume III-Estimation of Air Emissions from Cleanup Activities at Superfund Sites. Interim Final.* EPA-450/1-89-003. January.

_______, 1989b. *Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation (Part A).* Interim Final. EPA 540/1-89/002. December.

_______, 1990a. *National Oil and Hazardous Substances Pollution Control Contingency Plan. Final Rule.* Fed. Reg. 55:8666-8865. March 8.

_______, 1991. *Risk Assessment Guidance for Superfund. Volume I - Human Health Evaluation Manual (Part B. Development of Risk-Based Preliminary Remediation Goals). Interim.* Office of Emergency and Remedial Response, Washington, D.C. Publication 92857-01B. December.

Winges, K.D., 1990b. *User's Guide for the Fugitive Dust Model (FDM) (revised).* Volume 1: User's Instructions. Prepared for: Region 10 U.S. Environmental Protection Agency. EPA-910/9-88-202R. May.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding L

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

TABLES

Table E-1. Vapor Emission Rate of cPNAs Modeled as Benzo(a)pyrene During Construction Scenario 1009 Mission Street San Francisco Redevelopment Agency

SHEN MODEL /a/

Parameter Symbol	Parameter Definition	Value
MWi	Chemical Molecular Weight	252.09
Di	Diffusion Coefficient (cm^2/sec)	4.65E-02
T	Soil/Air Temperature (K)	298
Pi	Chemical Vapor Pressure @ T (mmHg)	5.60E-09
Cs	Equilibrium Vapor Concentration (g/cm^3)	7.60E-14
Pt	Total Soil Porosity (.55 dry, .35 wet)	0.55
x	Concentration of chemical in soil (mg/kg) (based on borings included in analysis)	34.3
Wi	Weight fraction of chemical in soil	3.43E-05
L	Depth of soil cover (cm)	1
A	Surface area (cm^2)	1.44E+07
Q	Emission rate (g/sec)	7.88E-13
AF	Agitation Factor	37
Q'	Adjusted Emission Rate	2.91E-11

BOX MODEL /b/

Parameter Symbol	Parameter Definition	Value
Q'	Adjusted emission rate (g/sec)	2.91E-11
w	Width of area source (m)	55
CF	Conversion factor (mg/g)	1000
H	Height of box (m)	2
U	Wind speed (m/sec)	4.7
A	Source area (m^2)	1439
Ci	Onsite vapor air concentration (mg/m^3)	1.18E-10

/a/ Model based on Shen, 1981.
/b/ Model based on Dobbins, 1979.
Note: For risk assessment purposes, values expressed in scientific notation.

Table E-2. Onsite Dust Air Concentration for Construction Worker /a/ During Construction Scenario 1009 Mission Street San Francisco Redevelopment Agency

Parameter Symbol	Parameter Definition	Value
E	Emission rate (mg/m^2-sec)	1.13E-01
w	Width of area source (m)	59.5
H	Height of box (m)	2
U	Wind speed (m/s)	4.7
Ci	Onsite dust air concentration (mg/m^3)	7.15E-01

/a/ Model based on Dobbins, 1979; non-chemical specific.

Note: For risk assessment purposes, values expressed in scientific notation.

Table E-3. Estimated Dust Air Concentrations Based on FDM-Onsite Construction Workers /a/ During Construction Scenario 1009 Mission Street San Francisco Redevelopment Agency

Average Scenario

Chemical	FDM Air Air Concentration (ug/m^3)	Arithmetic Mean Soil Concentration (wt fraction)	Air Dust Chemical Concentration (ug/m^3)	Air Dust Chemical Concentration (mg/m^3)
Arsenic	2.17E+02	5.02E-05	1.09E-02	1.09E-05
Benzo(a)anthracene	2.17E+02	9.80E-07	2.13E-04	2.13E-07
Benzo(a)pyrene	2.17E+02	9.60E-07	2.09E-04	2.09E-07
Benzo(k)fluoranthene	2.17E+02	1.03E-06	2.24E-04	2.24E-07
Chromium VI	2.17E+02	1.96E-05	4.26E-03	4.26E-06
Chrysene	2.17E+02	1.13E-06	2.46E-04	2.46E-07
Indeno(1,2,3-cd)pyrene	2.17E+02	1.61E-06	3.50E-04	3.50E-07
Lead	2.17E+02	2.91E-03	6.32E-01	6.32E-04
Thallium	2.17E+02	1.40E-04	3.04E-02	3.04E-05

Reasonable Maximum Exposure Scenario

Chemical	FDM Air Air Concentration (ug/m^3)	95% Confidence Level Soil Concentration (wt fraction)	Air Dust Chemical Concentration (ug/m^3)	Air Dust Chemical Concentration (mg/m^3)
Arsenic	2.17E+02	5.02E-05	1.09E-02	1.09E-05
Benzo(a)anthracene	2.17E+02	5.90E-06	1.28E-03	1.28E-06
Benzo(a)pyrene	2.17E+02	5.73E-06	1.25E-03	1.25E-06
Benzo(k)fluoranthene	2.17E+02	6.63E-06	1.44E-03	1.44E-06
Chromium VI	2.17E+02	1.96E-05	4.26E-03	4.26E-06
Chrysene	2.17E+02	6.88E-06	1.50E-03	1.50E-06
Indeno(1,2,3-cd)pyrene	2.17E+02	9.20E-06	2.00E-03	2.00E-06
Lead	2.17E+02	1.25E-02	2.72E+00	2.72E-03
Thallium	2.17E+02	1.40E-04	3.04E-02	3.04E-05

/a/ Model based on Ermak, 1977.

Note: For risk assessment purposes, values expressed in scientific notation.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Appendix F

METHODS USED FOR ESTIMATING OFFSITE DEPOSITION OF ENTRAINED CHEMICAL-CONTAINING DUSTS

LIST OF TABLES

Table F-1 Results of FDM Modeling for Offsite Non-Agricultural Deposition of Chemicals from Soil

Table F-2 Results of FDM Modeling for Offsite Agricultural Deposition of Chemicals from Soil

The following describes the deposition model used to estimate soil concentrations of chemicals in offsite soil. The offsite air concentrations estimated in Appendix E, Table E-3 based on the FDM were also used in the FDM to account for deposition as described below.

The FDM accounts for deposition through two parameters: the gravitational settling velocity and the deposition velocity. The gravitational settling velocity accounts for removal of particulate matter from the atmosphere due to gravity. Since only the larger particles have sufficient mass to overcome turbulent eddies, this mechanism is significant only for the larger size ranges (e.g., particles greater than 30 micrometers). The deposition velocity accounts for removal of particles by all methods, including turbulent motion, which brings the particulate matter into contact with the surface and allows it to be removed by impaction or adsorption at the surface. It is known that for smaller particles, the deposition velocity is significantly different from the gravitational settling velocity, while for large particles they are roughly the same (*Nifong and Winchester 1970*).

In the FDM, the dust emission factor as described in Appendix E, Section 1.0, was used as input for the model, as the emission rate representing onsite dust emissions. Each of the classes has a unique gravitational settling velocity and deposition velocity. The method used by the model to compute the gravitational settling velocities and deposition velocities is modeled after the work of Sehmel and Hodgson (*1978*).

Key inputs to the FDM are the roughness height and the friction velocity. The roughness height is an input parameter of the model. The roughness height was assumed to be 2.0 m for 1028 Howard Street, per the recommendations of the FDM User's Guide (*EPA, 1990*) for buildings or other large structures in close proximity to the area

emission source. Friction velocities are calculated internally in the FDM from the wind speed and the reference height of the meteorological data based upon the computer program of McRae (*1977*).

A major difference between FDM and other available air quality models is the ability to treat both turbulent and gravitational removal mechanisms for particles. In doing so, the gradient-transfer deposition algorithm is used. Another advantage of the FDM is the ability to quantitatively treat conservation of mass. As a plume of dust particles entrained in the air gradually moves in the direction of the prevailing winds, some fraction of these particles deposit and are therefore removed from the remaining plume. In general, the larger and heavier particles are removed earlier, or at a closer distance to the source. than smaller particles. The FDM accounts for this phenomenon, and therefore eliminates overly conservative "double counting" of results by accounting for the decrease of available suspended particles as the plume continues to move away from the source. In this assessment, both "agricultural" and "nonagricultural" deposition were modeled. For agricultural deposition, a mixing depth of 0.15 m was used to allow for root uptake of deposited chemicals. For nonagricultural deposition, a mixing depth of 0.01 m was used for direct soil contact exposure scenarios (dermal and ingestion of soil exposures). Tables F-1 and F-2 present the unit deposition rate from the FDM for offsite receptors and the weight fraction of soil concentrations for average and RME scenarios. These two values are multiplied to obtain the chemical deposition rate (CDR). The following formula is then used to obtain the air concentration in soil (ACS):

ACS: (CDR X Avg. time X CF)/D

where:

Avg. time - Averaging time (18 days)

CF - Conversion factor sec - day (86,400)

D - Soil Mixing Depth (0.01 m or 0.15 m)

The ACS is then divided by the soil density (1.5 kg/m^3) to obtain the deposited soil concentration for offsite receptors for risk characterization. The output printout of all FDM results, including air dust concentrations, is included at the end of this appendix.

References

Horst, T.W. and J.C. Doran, 1984. *Experimental Evaluation of Plume Depletion Models.* Conference Volume: Fourth Joint Conference on Applications of Air Pollution Meteorology, 16-19 October, Portland, Oregon, American Meteorological Society, Boston, Massachusetts.

McRae, G.J., 1977. *Computer Program for Calculation of the Friction Velocity,* Environmental Quality Laboratory, 206-40, California Institute of Technology, Pasadena, California.

Nifong, G. D. and J.W., Winchester, 1970. *Particle Size Distributions of Trace Elements in Pollution Aerosols.* University of Michigan, Document No. C00-1705-8. August.

Sehmel, G.A. and W.H. Hodgson, 1978. *Model for Predicting Dry Deposition of Particles and Gases to Environmental Surfaces.* PNL-SA-6721, Battelle Pacific Northwest Laboratories, Richland, Washington.

Turner, D.B. 1970. *Workbook of Atmospheric Dispersion Estimates.* EPA AP-26. Research Triangle Park, N.C.

U.S. Environmental Protection Agency (EPA), 1990, *User's Guide for the Fugitive Dust Model (FDM)(revised). Vol. 1: User's Instructions.* Region 10, Seattle, Washington. EPA-910/9-88-202R.

TABLES

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table F-1. Results of FDM Modeling for Offsite Non-Agricultural Deposition of Chemicals from Soil /a/
During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Average Scenario

Chemical	Dust Deposition Rate (ug/m^2-sec)	Arithmetic Mean Soil Concentration (wt fraction)	Chemical Deposition Rate (ug/m^2-sec)	Air Concentration in Soil (ug/m^3)	Deposited Soil Concentration (ppm-w)
Arsenic	10.70	5.02E-05	5.37E-04	8.35E+04	5.57E-02
Benzo(a)anthracene	10.70	9.80E-07	1.05E-05	1.63E+03	1.09E-03
Benzo(a)pyrene	10.70	9.60E-07	1.03E-05	1.60E+03	1.06E-03
Benzo(k)fluorantene	10.70	1.03E-06	1.10E-05	1.71E+03	1.14E-03
Chromium VI	10.70	1.96E-05	2.10E-04	3.26E+04	2.17E-02
Chrysene	10.70	1.13E-06	1.21E-05	1.88E+03	1.25E-03
Indeno(1,2,3-cd)pyrene	10.70	1.61E-06	1.72E-05	2.68E+03	1.79E-03
Lead	10.70	2.91E-03	3.11E-02	4.84E+06	3.22E+00
Thallium	10.70	1.40E-04	1.50E-03	2.33E+05	1.55E-01

Reasonable Maximum Exposure Scenario

Chemical	Dust Deposition Rate (ug/m^2-sec)	95% Confidence Level Soil Concentration (wt fraction)	Chemical Deposition Rate (ug/m^2-sec)	Air Concentration in Soil (ug/m^3)	Deposited Soil Concentration (ppm-w)
Arsenic	10.70	5.02E-05	5.37E-04	8.35E+04	5.57E-02
Benzo(a)anthracene	10.70	5.90E-06	6.31E-05	9.82E+03	6.54E-03
Benzo(a)pyrene	10.70	5.73E-06	6.13E-05	9.53E+03	6.36E-03
Benzo(k)fluorantene	10.70	6.63E-06	7.09E-05	1.10E+04	7.35E-03
Chromium VI	10.70	1.96E-05	2.10E-04	3.26E+04	2.17E-02
Chrysene	10.70	6.88E-06	7.36E-05	1.14E+04	7.63E-03
Indeno(1,2,3-cd)pyrene	10.70	9.20E-06	9.84E-05	1.53E+04	1.02E-02
Lead	10.70	1.25E-02	1.34E-01	2.08E+07	1.39E+01
Thallium	10.70	1.40E-04	1.50E-03	2.33E+05	1.55E-01

/a/ See Appendix F text for explanation.

Note: For risk assessment purposes, values expressed in scientific notation.

Table F-2. Results of FDM Modeling for Offsite Agricultural Deposition of Chemicals from Soil /a/
During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Average Scenario

Chemical	Dust Deposition Rate (ug/m^2-sec)	Arithmetic Mean Soil Concentration (wt fraction)	Chemical Deposition Rate (ug/m^2-sec)	Air Concentration in Soil (ug/m^3)	Deposited Soil Concentration (ppm-w)
Arsenic	10.70	5.02E-05	5.37E-04	5.57E+03	3.71E-03
Benzo(a)anthracene	10.70	9.80E-07	1.05E-05	1.09E+02	7.25E-05
Benzo(a)pyrene	10.70	9.60E-07	1.03E-05	1.06E+02	7.10E-05
Benzo(k)fluorantene	10.70	1.03E-06	1.10E-05	1.14E+02	7.62E-05
Chromium VI	10.70	1.96E-05	2.10E-04	2.17E+03	1.45E-03
Chrysene	10.70	1.13E-06	1.21E-05	1.25E+02	8.36E-05
Indeno(1,2,3-cd)pyrene	10.70	1.61E-06	1.72E-05	1.79E+02	1.19E-04
Lead	10.70	2.91E-03	3.11E-02	3.22E+05	2.15E-01
Thallium	10.70	1.40E-04	1.50E-03	1.55E+04	1.04E-02

Reasonable Maximum Exposure Scenario

Chemical	Dust Deposition Rate (ug/m^2-sec)	95% Confidence Level Soil Concentration (wt fraction)	Chemical Deposition Rate (ug/m^2-sec)	Air Concentration in Soil (ug/m^3)	Deposited Soil Concentration (ppm-w)
Arsenic	10.70	5.02E-05	5.37E-04	5.57E+03	3.71E-03
Benzo(a)anthracene	10.70	5.90E-06	6.31E-05	6.54E+02	4.36E-04
Benzo(a)pyrene	10.70	5.73E-06	6.13E-05	6.36E+02	4.24E-04
Benzo(k)fluorantene	10.70	6.63E-06	7.09E-05	7.35E+02	4.90E-04
Chromium VI	10.70	1.96E-05	2.10E-04	2.17E+03	1.45E-03
Chrysene	10.70	6.88E-06	7.36E-05	7.63E+02	5.09E-04
Indeno(1,2,3-cd)pyrene	10.70	9.20E-06	9.84E-05	1.02E+03	6.80E-04
Lead	10.70	1.25E-02	1.34E-01	1.39E+06	9.24E-01
Thallium	10.70	1.40E-04	1.50E-03	1.55E+04	1.04E-02

/a/ See Appendix F text for explanation.

Note: For risk assessment purposes, values expressed in scientific notation.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Appendix G

METHOD FOR EVALUATING PLANT UPTAKE OF CHEMICALS

LIST OF TABLES

Table G-1 Uptake of Chemicals from Soil Into Fruit - Average Scenario, During Construction Scenario

Table G-2 Uptake of Chemicals from Soil Into Vegetables - Average Scenario, During Construction Scenario

Table G-3 Uptake of Chemicals from Soil Into Fruit - Reasonable Maximum Exposure Scenario, During Construction Scenario

Table G-4 Uptake of Chemicals from Soil Into Vegetables - Reasonable Maximum Exposure Scenario, During Construction Scenario

This appendix describes models used to calculate concentrations of chemicals in fruits and vegetables grown in site soils based on the soil concentrations reported for the site. Because plants have active transport systems designed to distribute nutrients to all parts of the plant, there is a potential for uptake of a chemical in soil to plant tissues.

The rate of chemical uptake from soil through the roots is extremely variable. Chemicals must be taken up through the roots and then be distributed to edible portions of the plant. This distribution is dependent upon the soil characteristics, the plant species, and the chemical characteristics and concentration.

The model applied here to estimate plant chemical concentrations due to uptake of chemicals present in root zone soils is by Baes et al. (*1984*). In Baes et al. (*1984*), soil-to-plant transfer factors, designated as "B" parameters, are calculated and presented for all inorganic elements. In presenting these B-factors, Baes et al. (*1984*) searched the relevant literature and extracted data giving the steady-state chemical concentrations in soil and the resulting concentration in the plant for various plants in contact with soil which contained chemicals at the root zone depth. Baes et al. (*1984*) noticed a linear relationship between the soil concentrations of a particular element and the resulting concentration in a plant growing in soil, as follows:

$$Cpd = Bd/Csd \qquad \text{(Equation G-1)}$$

where:

Cpd = Steady-state chemical concentration in plant (dry weight basis)

Bd = Proportionality factor (soil-to-plant transfer factor, dry weight basis)

Csd = Chemical concentration in the soil (dry weight basis).

Baes et al. (*1984*) further observed that this linear relationship applied separately to vegetative (i.e., non-reproductive) tissues and reproductive tissues is as follows:

Cpdv = (Bdv)(Csd) (Equation G-2)

Cpdr = (Bdr)(Csd) (Equation G-3)

where:

Cpdv = Concentration of chemical in vegetative tissues of plant (dry weight basis)

Bdv = Soil-to-plant transfer factor for vegetative tissues of plant (dry weight basis)

Cpdr = Concentration of chemical in reproductive tissues of plant (dry weight basis)

Bdr = Soil-to-plant transfer factor for reproductive tissues of plant (dry weight basis).

Although Baes et al. (*1984*) has compiled values for some of these B-factors, only Bdv values for inorganic elements have been tabulated (*Baes et al., 1984*). For organic chemicals, the data in the literature showing experimentally measured values of the soil chemical and plant chemical concentrations are not as readily available, so it is difficult to directly obtain the corresponding B-factors. Instead, a relationship between the soil-to-plant transfer factor and the logarithm of the octanol-water partition coefficient, described by Travis and Arms (*1988*), can be used to estimate values for B-factors for organic chemicals, as follows:

log Bdv = 1.588 - 0.578 log Kow (Equation G-4)

Additionally, Bdr may be estimated as 10% of the value for the vegetative factor (*Baes et al, 1984*) and is described as Frv. Therefore, using the values given in Baes et al. (1984) for Bdv for inorganic elements, the Travis and Arms (*1988*) relationship for

organic chemicals, and the Baes et al. (*1984*) 10% method for Bdr, it is possible to obtain Bdv or Bdr for either inorganic or organic chemicals. It should be emphasized that, regardless of the method or source used to obtain values for these B-factors, they are chemical- and plant-specific parameters; certain generalizations or assumptions must usually be made regarding the effect of different plant types.

In order to apply these B-factors in estimating chemical uptake into fruits or vegetables, it is necessary to convert these dry weight B- factors to fresh or "wet" weight values. For fruits, a reproductive portion of plants, only Bdr must be converted to a wet weight basis. For vegetables, which consist of both vegetative and reproductive plant tissues (i.e., Bdr and Bvd), a composite B-factor must be developed and converted to a wet weight basis.

For fruits and reproductive tissues of vegetables, the wet weight transfer factor (Bwr) was calculated from the dry weight uptake factor (Bdr) using the following equation:

$$\text{Bwr} = \text{Bdr (Rr/Rs)} \qquad \text{(Equation G-5)}$$

where:

Rr = Dry-to-wet conversion factor for reproductive portions of plant (Baes et al., 1984)

Rs = Correction for soil moisture content (Rs = 1.0 - fractional soil moisture content [SM; 0.35]).

For estimating chemical uptake into fruits, a value of 0.54 was used as the Rr, which represents plums and prunes (*Baes et al., 1984*). Although plums and prunes may not actually be grown in site soils, they were conservatively selected as representative fruits since they have the highest dry-to-weight conversion factor (*Baes et al., 1984*),

and therefore will take up a maximum concentration of chemicals in soil. Then, by multiplying the calculated Bwr for fruits by the soil chemical concentration on a wet weight basis, Csw, which is generally the value available from laboratory analysis of soil samples, the concentration of the chemical in fruit represented by plums and prunes, Cfw, may be estimated.

For chemical uptake into vegetables, it is necessary to obtain a value for Bwv, the wet weight transfer factor for vegetative plant tissues. This may be done as follows:

$$Bwv = Bdv\,(Rv/Rs) \qquad \text{(Equation G-6)}$$

where:

Rv = Dry-to-wet conversion factor for vegetative tissues of plant (*Baes, et al., 1984*)

A composite transfer factor, Bwt, based on a wet weight is then calculated as follows:

$$Bwt = LVF \times Bwv + RF \times Bwr \qquad \text{(Equation G-7)}$$

where:

LVF = Fraction of leafy vegetables ingested (composed of vegetative plant tissues)

RF = Remaining fraction of vegetables ingested (1.0 - LVF)

For consumption of vegetables, it is assumed that both leafy and non-leafy vegetables will be ingested. For leafy vegetables, a value of 0.070 was used for Rv in calculating Bwv; this value of Rv is based on data for asparagus (*Baes et al., 1984*). For non-leafy vegetables, a value of 0.261 for Rr is used to calculate Bwr, and is based on sweet corn (*Baes et al., 1984*). These vegetables were chosen on the basis of their dry-to-wet conversion factors (*Baes, et al., 1984*), and on available data. A value of 0.261 for reproductive tissues is above the weighted averages reported by Baes et al.

(*1984*) for a variety of vegetables, and is therefore a selection which will insure a conservative estimate of chemical uptake into homegrown vegetables comprised of edible reproductive issues. For ingestion of vegetable tissues, data is more limited; asparagus was selected as a representative vegetable comprised of edible reproductive tissues based on the available data from Baes et al., (*1984*). By multiplying Bwt by Csw, the concentration of the chemical in vegetables represented by asparagus and sweet corn, Cvegu, may be estimated.

It should be noted here that, for the sake of conservatism and in the absence of specific information on the types of fruits or vegetables future residents are likely to grow at the site, representative fruits and vegetables have been selected to provide the highest estimates of predicted plant chemical concentrations. This is done by selecting produce which has a low moisture content, and consequently a high Rr or Rv.

Tables G-1 and G-2 show the various parameters used to obtain values for Cfw and Cvegw for the average scenarios using the arithmetic mean as a soil concentration. Tables G-3 and G-4 present the parameters and values for the RME scenarios using the lesser of the 95 percent upper confidence limit and maximum as the soil concentrations. These values, Cfw and Cvegw, are the exposure point concentration for the ingestion of homegrown fruit and vegetables pathway of exposure.

References

Baes, C. F., R.D. Sharp, A. L. Sjoreen, and R.W. Shor, 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture.* Oak Ridge, TN: Oak Ridge National Laboratory\

Brady, N.C., 1984. *The Nature and Properties of Soils.* Mac Millan Publishing Company, New York, New York.

Travis C.C. and A.D. Arms, 1988. *Bioconcentration of Organics in Beef, Milk, and Vegetation.* Environ. Sci. Technol. 22:271-274.

TABLES

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table G-1. Uptake of Chemicals from Soil into Fruit - Average Scenario /a/
During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Parameter Definition	Parameter Symbol	Units	Arsenic	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(k) fluoranthene	Chromium (total)	Chrysene	Indeno(1,2,3-cd) pyrene	Lead	Thallium
Soil-to-plant transfer factor for vegetative portions of plant (dry weight)	Bdv /b/	dimensionless	4.00E-02	2.22E-02	1.22E-02	1.22E-02	7.00E-02	2.22E-02	6.78E-03	4.50E-02	4.00E-03
Log of soil-to-plant transfer factor for vegetative tissues of plant (dry weight)	log Bdv	dimensionless	1.01E+00	-1.65E+00	-1.91E+00	-1.91E+00	1.01E+00	-1.65E+00	-2.17E+00	--	--
Log of octanol-water partition coefficient	log Kow	dimensionless	1.00E+00	5.61E+00	6.06E+00	6.06E+00	1.00E+00	5.61E+00	6.50E+00	--	--
Soil-to-plant transfer factor for reproductive tissues of plant (dry weight)	Bdr	dimensionless	4.00E-03	2.22E-03	1.22E-03	1.22E-03	7.00E-03	2.22E-03	6.78E-04	4.50E-03	4.00E-04
Ratio of chemical uptake into reproductive tissues of plant to uptake into vegetative portions of plant	Frv	dimensionless	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Dry-to-wet conversion factor for non-vegetative plant (fruit)	Rr	dimensionless	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01
Correction for soil moisture content	Rs	dimensionless	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01
Soil moisture content	SM	dimensionless (fraction)	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01
Soil-to-plant transfer factor for reproductive tissues of plant (wet weight)	Bwr	dimensionless	3.32E-03	1.84E-03	1.01E-03	1.01E-03	5.82E-03	1.84E-03	5.63E-04	3.74E-03	3.32E-04
Chemical concentration in soil (wet weight)	Csw	mg/kg	3.71E-03	7.25E-05	7.10E-05	7.62E-05	1.45E-03	8.36E-05	1.19E-04	2.15E-01	1.04E-02
Chemical concentration in fresh fruit	Cfw	mg/kg	1.23E-05	1.33E-07	7.18E-08	7.70E-08	8.43E-06	1.54E-07	6.70E-08	8.04E-04	3.46E-06

/a/ Model based on Baes et al., 1984, and Travis and Arms, 1988.

/b/ Bdv value is either 0.2 or 0.04; not clear from Baes et al., 1984 - most conservative value used.

Note: For risk assessment purposes, values expressed in scientific notation.

Table G-2. Uptake of Chemicals from Soil into Vegetables - Average Scenario /a/
During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Parameter Definition	Parameter Symbol	Units	Arsenic	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(k) fluoranthene	Chromium (total)	Chrysene	Indeno(1,2,3-cd) pyrene	Lead	Thallium
Soil-to-plant transfer factor for vegetative portions of plant (dry weight)	Bdv /b/	dimensionless	4.00E-02	2.22E-02	1.22E-02	1.22E-02	7.00E-02	2.22E-02	6.78E-03	4.50E-02	4.00E-03
Log of soil-to-plant transfer factor for vegetative tissues of plant (dry weight)	log Bdv	dimensionless	1.01E+00	-1.65E+00	-1.91E+00	-1.91E+00	1.01E+00	-1.65E+00	-2.17E+00	--	--
Log of octanol-water partition coefficient	log Kow	dimensionless	1.00E+00	5.61E+00	6.06E+00	6.06E+00	1.00E+00	5.61E+00	6.50E+00	--	--
Soil-to-plant transfer factor for reproductive tissues of plant (dry weight)	Bdr	dimensionless	4.00E-03	2.22E-03	1.22E-03	1.22E-03	7.00E-03	2.22E-03	6.78E-04	4.50E-03	4.00E-04
Ratio of chemical uptake into reproductive tissues of plant to uptake into vegetative portions of plant	Frv	dimensionless	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Dry-to-wet conversion factor for reproductive vegetable tissues	Rr	dimensionless	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01
Correction for soil moisture content	Rs	dimensionless	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01
Soil moisture content	SM	dimensionless (fraction)	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01
Soil-to-plant transfer factor for reproductive tissues of plant (wet weight)	Bwr	dimensionless	1.61E-03	8.90E-04	4.89E-04	4.89E-04	2.81E-03	8.90E-04	2.72E-04	1.81E-03	1.61E-04
Soil-to-plant transfer factor for vegetative tissues of plant (wet weight)	Bwv	dimensionless	4.31E-03	2.39E-03	1.31E-03	1.31E-03	7.54E-03	2.39E-03	7.30E-04	4.85E-03	4.31E-04
Dry-to-wet conversion factor for vegetative tissues	Rv	dimensionless	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02
Fraction of leafy vegetable ingested	LVF	dimensionless	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01
Remaining fraction of vegetables ingested	RF	dimensionless	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01
Composite soil-to-plant transfer factor (wet weight)	Bwt	dimensionless	2.96E-03	1.64E-03	9.00E-04	9.00E-04	5.17E-03	1.64E-03	5.01E-04	3.33E-03	2.96E-04
Chemical concentration in soil (wet weight)	Csw	mg/kg	3.71E-03	7.25E-05	7.10E-05	7.62E-05	1.45E-03	8.36E-05	1.19E-04	2.15E-01	1.04E-02
Chemical concentration in fresh vegetable	Cvegw	mg/kg	1.10E-05	1.19E-07	6.39E-08	6.85E-08	7.50E-06	1.37E-07	5.97E-08	7.15E-04	3.08E-06

/a/ Model based on Baes et al., 1984, and Travis and Arms, 1988.
/b/ Bdv value is either 0.2 or 0.04; not clear from Baes et al., 1984 - most conservative value used.
Note: For risk assessment purposes, values expressed in scientific notation.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table G-3. Uptake of Chemicals from Soil into Fruit – Reasonable Maximum Exposure Scenario /a/
During Construction Scenario
1009 Mission Street
San Francisco Redevelopment Agency

Parameter Definition	Parameter Symbol	Units	Arsenic	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(k) fluoranthene	Chromium (total)	Chrysene	Indeno(1,2,3-cd) pyrene	Lead	Thallium
Soil-to-plant transfer factor for vegetative portions of plant (dry weight)	Bdv /b/	dimensionless	4.00E-02	2.22E-02	1.22E-02	1.22E-02	7.00E-02	2.22E-02	6.78E-03	4.50E-02	4.00E-03
Log of soil-to-plant transfer factor for vegetative tissues of plant (dry weight)	log Bdv	dimensionless	1.01E+00	-1.65E+00	-1.91E+00	-1.91E+00	1.01E+00	-1.65E+00	-2.17E+00	--	--
Log of octanol-water partition coefficient	log Kow	dimensionless	1.00E+00	5.61E+00	6.06E+00	6.06E+00	1.00E+00	5.61E+00	6.50E+00	--	--
Soil-to-plant transfer factor for reproductive tissues of plant (dry weight)	Bdr	dimensionless	4.00E-03	2.22E-03	1.22E-03	1.22E-03	7.00E-03	2.22E-03	6.78E-04	4.50E-03	4.00E-04
Ratio of chemical uptake into reproductive tissues of plant to uptake into vegetative portions of plant	Frv	dimensionless	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Dry-to-wet conversion factor for non-vegetative plant (fruit)	Rr	dimensionless	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01	5.40E-01
Correction for soil moisture content	Rs	dimensionless	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01
Soil moisture content	SM	dimensionless (fraction)	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01
Soil-to-plant transfer factor for reproductive tissues of plant (wet weight)	Bwr	dimensionless	3.32E-03	1.84E-03	1.01E-03	1.01E-03	5.82E-03	1.84E-03	5.63E-04	3.74E-03	3.32E-04
Chemical concentration in soil (wet weight)	Csw	mg/kg	3.71E-03	4.36E-04	4.24E-04	4.90E-04	1.45E-03	5.09E-04	6.80E-04	9.24E-01	1.04E-02
Chemical concentration in fresh fruit	Cfw	mg/kg	1.23E-05	8.03E-07	4.28E-07	4.96E-07	8.43E-06	9.36E-07	3.83E-07	3.45E-03	3.46E-06

/a/ Model based on Baes et al., 1984, and Travis and Arms, 1988.

/b/ Bdv value is either 0.2 or 0.04; not clear from Baes et al., 1984 – most conservative value used.

Note: For risk assessment purposes, values expressed in scientific notation.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table G-4. Uptake of Chemicals from Soil into Vegetables - Reasonable Maximum Exposure Scenario /a/

During Construction Scenario

009 Mission Street

San Francisco Redevelopment Agency

Parameter Definition	Parameter Symbol	Units	Arsenic	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(k) fluoranthene	Chromium (total)	Chrysene	Indeno(1,2,3-cd) pyrene	Lead	Thallium
Soil-to-plant transfer factor for vegetative portions of plant (dry weight)	Bdv /b/	dimensionless	4.00E-02	2.22E-02	1.22E-02	1.22E-02	7.00E-02	2.22E-02	6.78E-03	4.50E-02	4.00E-03
Log of soil-to-plant transfer factor for vegetative tissues of plant (dry weight)	log Bdv	dimensionless	1.01E+00	-1.65E+00	-1.91E+00	-1.91E+00	1.01E+00	-1.65E+00	-2.17E+00	--	--
Log of octanol-water partition coefficient	log Kow	dimensionless	1.00E+00	5.61E+00	6.06E+00	6.06E+00	1.00E+00	5.61E+00	6.50E+00	--	--
Soil-to-plant transfer factor for reproductive tissues of plant (dry weight)	Bdr	dimensionless	4.00E-03	2.22E-03	1.22E-03	1.22E-03	7.00E-03	2.22E-03	6.78E-04	4.50E-03	4.00E-04
Ratio of chemical uptake into reproductive tissues of plant to uptake into vegetative portions of plant	Frv	dimensionless	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Dry-to-wet conversion factor for reproductive vegetable tissues	Rr	dimensionless	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01	2.61E-01
Correction for soil moisture content	Rs	dimensionless	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01	6.50E-01
Soil moisture content	SM	dimensionless (fraction)	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01	3.50E-01
Soil-to-plant transfer factor for reproductive tissues of plant (wet weight)	Bwr	dimensionless	1.61E-03	8.90E-04	4.89E-04	4.89E-04	2.81E-03	8.90E-04	2.72E-04	1.81E-03	1.61E-04
Soil-to-plant transfer factor for vegetative tissues of plant (wet weight)	Bwv	dimensionless	4.31E-03	2.39E-03	1.31E-03	1.31E-03	7.54E-03	2.39E-03	7.30E-04	4.85E-03	4.31E-04
Dry-to-wet conversion factor for vegetative tissues	Rv	dimensionless	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02	7.00E-02
Fraction of leafy vegetable ingested	LVF	dimensionless	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01
Remaining fraction of vegetables ingested	RF	dimensionless	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01	5.00E-01
Composite soil-to-plant transfer factor (wet weight)	Bwt	dimensionless	2.96E-03	1.64E-03	9.00E-04	9.00E-04	5.17E-03	1.64E-03	5.01E-04	3.33E-03	2.96E-04
Chemical concentration in soil (wet weight)	Csw	mg/kg	3.71E-03	4.36E-04	4.24E-04	4.90E-04	1.45E-03	5.09E-04	6.80E-04	9.24E-01	1.04E-02
Chemical concentration in fresh vegetable	Cvegw	mg/kg	1.10E-05	7.14E-07	3.81E-07	4.41E-07	7.50E-06	8.33E-07	3.41E-07	3.07E-03	3.08E-06

/a/ Model based on Baes et al., 1984, and Travis and Arms, 1988.

/b/ Bdv value is either 0.2 or 0.04; not clear from Baes et al., 1984 - most conservative value used.

Note: For risk assessment purposes, values expressed in scientific notation.

Appendix H

METHODS AND CALCULATIONS USED IN RISK CHARACTERIZATION

TABLE OF CONTENTS

1.0	RISK CHARACTERIZATION		H-1
1.1	Noncarcinogenic Adverse Health Effects		H-2
	1.1.1	Intake Assumptions	H-2
	1.1.2	Toxicity Values	H-8
	1.1.3	Quantification Methods	H-8
1.2	Carcinogenic Health Risks		H-9
	1.2.1	Intake Assumptions	H-10
	1.2.2	Toxicity Values	H-10
	1.2.3	Quantification Methods	H-10

Appendix H

1.0 RISK CHARACTERIZATION

A dose is the amount of chemical to which a receptor is exposed. Intake assumptions, including absorption and bioavailability factors, exposure duration, age of receptor(s), body weight(s), and contact rates, are used to calculate the dose. This dose is then used to estimate the potential for carcinogenic health risks and adverse noncarcinogenic adverse health effects from exposure to the COCs. This section discusses the methods used to quantify the potential carcinogenic and noncarcinogenic risks for the average and RME exposure scenarios discussed in Section 4.0 of the main document.

1.1 Noncarcinogenic Adverse Health Effects

1.1.1 Intake Assumptions

The following describes the assumptions and methods used to estimate the daily intakes (doses) of noncarcinogens from the inhalation of fugitive dust, ingestion of soil and dermal contact with soil, and ingestion of fruits and vegetables. The intake assumptions for inhalation of fugitive dusts were used to evaluate inhalation vapors as a potential significant pathway as presented in Appendix E.

Assumptions used in the evaluation of ingestion exposures include ingestion rates, soil concentrations, exposure duration, and absorption factors. The specific assumptions used in Section 4.0 and presented in Table 4-12a through 4-23 are discussed below.

Pre-Construction Scenario

Exposure Times, Frequencies, and Durations

- Exposure frequencies for onsite residential populations under the average scenario were assumed to be 350 days/year for an exposure duration of 9 years for adults (ages 18-27 years), and 5 and 4 years for children ages 0-5 and 5-9 years, respectively, for a total exposure of 9 years for a child, for all dermal contact, ingestion, and inhalation scenarios (*EPA, 1989b; 1991a,c*).

- Exposure frequencies for onsite residential populations under the RME scenario were assumed to be 350 days/year for exposure durations of 30 years for adults (ages 18-48 years), and 5, 6, 7, and 12 years for children ages 0-5, 5-11, 11-18 and 18-30 years, respectively, for a total exposure of 30 years, for all dermal contact, ingestion and inhalation scenarios (*EPA, 1989b; 1991a,c*).

- An exposure time of 2 hrs/day was assumed for all onsite resident children inhaling dusts in outdoor air, and 0.44 hrs/day for all adult residents inhaling dusts in outdoor air (*EPA, 1990a*).

- An exposure time of 16.4 hrs/day was assumed for all onsite residents inhaling dusts in indoor air (*EPA, 1990a*).

Inhalation and Ingestion Rates

- Inhalation rates for outdoor air for onsite resident adults and children were estimated by assuming various levels of activity such as moderate or light activity (*EPA, 1990a*). Onsite adult residents were assumed to inhale at a rate of 1.4 m^3/hour for the average scenario and 3.0 m^3/hour for the RME scenario. Children aged 0-5 and 5-9 were assumed to inhale at a rate of 1.24 m^3/hour and 1.79 m^3/hour, respectively, for the average scenario. Children aged 0-5, 5-11, and 11-18 years were assumed to inhale at a rate of 2.20 m^3/hour, 3.70 m^3/hour, and 3.70 m^3/hour, respectively, under the RME scenario.

- Inhalation rates for indoor air for onsite residents adults and children were estimated by assuming various levels of activity such as light activity or resting (*EPA, 1990a*). Onsite adult residents were assumed to inhale at a rate of 0.63 m^3/hour for the average scenario and 0.89 for the RME scenario. Children aged 0-5 and 5-9 were assumed to inhale at a rate of 0.66 m^3/hour and 0.81 m^3/hour, respectively, for the average scenario. Children aged 0-5, 5-11 and 11-18 years were assumed to inhale at a rate of 0.90 m^3/hour, 1,23 m^3/hour, and 1.24 m^3/hour, respectively, under the RME scenario.

- For residents, a soil ingestion rate of 100 mg/day was assumed for all age group and exposure scenarios with the exception of children aged 0-5 years, for which a soil ingestion rate of 200 mg/day was applied (*EPA, 1989b*).

Skin Surface Areas

- Skin surface areas for both onsite and offsite workers were assumed to be 2,287 cm^2 for the average scenario and 5,681 for the RME scenario. For onsite residents, exposed skin areas of 1,818, 2,204, and 2,287 cm^2 was assumed for children aged 0-5 years, 5-9 years, and adults aged 18-27 years, respectively, for the average scenario. For onsite residents under the RME scenario, exposed skin surface areas of 4,288, 6,329, 10,265, and 5,681 cm^2 were assumed for children aged 0-5 years, 5-11 years, 11-18 years, and all adults, respectively (*EPA, 1990a*).

- For onsite residents, exposed skin areas of 1,818, 2,204, and 2,287 cm^2 was assumed for children aged 0-5 years, 5-9 years, and adults aged 18-27 years, respectively, for the average scenario. For onsite residents under the RME scenario, exposed skin surface areas of 4,288, 6,329, 10,265, and 5,681 cm^2 were assumed for children aged 0-5 years, 5-11 years, 11-18 years, and all adults, respectively (*EPA, 1990a*).

Soil Adherence Factor

- A dermal soil adherence factor of 1.0 mg/cm^2 was assumed for all population groups and exposure scenarios (*EPA, 1989b; 1991b*).

Body Weights

- An average body weight of 70 kg was assumed for all adult receptors for both average RME scenarios. Average body weights of 13 and 24 kg were assumed for children aged 0-5 and 5-9 years, respectively, under the average scenario. Under the RME scenario, average body weights of 13, 27, and 54 kg were assumed for children aged 0-5, 5-11, and 11-18 years, respectively (*EPA, 1990a*).

Absorption Factors

- Absorption factors for the pulmonary tract (inhalation) exposure, gastrointestinal tract (ingestion) exposure, and skin (dermal exposure) were considered. An absorption factor is the percent of chemical that crosses body membranes and enters the human bloodstream. An absorption factor of 1.0 was used for inhalation and ingestion exposure scenarios since the toxicity values are based on administered doses and already consider absorption. For dermal exposures, absorption factors of 0.01 (1%) for metals and 0.15 (15%) for carcinogenic cPNAs (*EPA, 1989a; 1991b*) were used.

During Construction Scenario

- Exposure frequencies for onsite workers were assumed to be 30 days/year for an exposure duration of 1 year for an average scenario and 250 days/year for an exposure duration of 1 year for the RME scenario for dermal contact, ingestion, and inhalation scenarios (*EPA, 1989b; 1991a,c*).

- Exposure frequencies for offsite workers were assumed to be 30 days/year for an average scenario for an exposure duration of 1 year and 250 days/year for a RME scenario for an exposure duration of 1 year for inhalation of dusts. Exposure frequencies for offsite workers for ingestion and dermal contact were assumed to be 250 days/year for the average scenario for an exposure duration of 9 years and 250 days/year for the RME scenario for an exposure duration of 25 years (*EPA, 1989b; 1991a,c*).

- Exposure frequencies for offsite residential populations under the average scenario were assumed to be 350 days/year for an exposure duration of 9 years for adults (ages 18-27 years), and 5 and 4 years for children ages 0-5 and 5-9 years, respectively, for a total exposure of 9 years for a child, for all dermal contact and ingestion scenarios (*EPA, 1989b; 1991a,c*).

- Exposure frequencies for offsite residential populations under the RME scenario were assumed to be 350 days/year for exposure durations of 30 years for adults (ages 18-48 years), and 5, 6, 7 and 12 years for children ages 0-5, 5-11, 11-18 and 18-30 years, respectively, for a total exposure of 30 years, for all dermal contact and ingestion scenarios (*EPA, 1989b; 1991a,c*).

- For inhalation of dusts by offsite residents, exposure frequencies under the average scenario were assumed to be 30 days/year for an exposure duration of 1 year. Under the RME exposure scenario, exposure frequency was assumed to be 350 days/year for an exposure duration of 1 year (*EPA, 1989b; 1991a,c*).

- An exposure time of 8 hrs/day was assumed for all on- and off-site worker populations for inhalation of dusts. An exposure time of 2 hours/day was assumed for all offsite child residents inhaling dusts in outdoor air, and 0.44 hours/day for all adult residents inhaling dusts in outdoor air (*EPA, 990a*).

Inhalation and Ingestion Rates

- Inhalation rates for workers and resident adults and children were estimated by assuming various levels of activity such as moderate or light activity (*EPA, 1990a*). Adult workers were assumed to inhale at a rate of

1.4 m^3/hour. Offsite adult residents were assumed to inhale at a rate of 1.4 m^3/hour for the average scenario and 3.0 m^3/hour for the RME scenario. Children age 0-5 and 5-9 were assumed to inhale at a rate of 1.24 m^3/hour and 1.79 m^3/hour, respectively for the average scenario. Children aged 0-5, 5-11, and 11-18 years were assumed to inhale at a rate of 2.20 m^3/hour, 3.70 m^3/hour, and 3.70 m^3/hour, respectively, under the RME scenario.

- Soil ingestion rates for onsite workers were assumed to be 480 mg/day for both the average and RME scenarios *(Hawley, 1985)*. For offsite workers, a soil ingestion rate of 50 mg/day was assumed for both exposure scenarios (*EPA, 1991a*).

- For ingestion of fruits and vegetables, a seasonal factor of 20% was applied to the average scenario, and 50% to the RME scenario (*EPA, 1990a*).

- For ingestion of homegrown fruits, it was assumed that children aged 0-5 years and 5-11 years would ingest fruit at a rate of 0.14 and 0.15 kg/day, respectively. For the average scenario, the fruit ingestion rate for adults aged 18-27 years was assumed to be 0.12 kg/day. Under the RME scenario, children aged 11-18 years, adults aged 18-30 years, and adults aged 18-48 years are assumed to ingest fruit at a rate of 0.14, 0.12, and 0.13 kg/day, respectively (*EPA, 1990a*). All other age groups were the same s the average scenarios.

- For ingestion of homegrown vegetables, the vegetable ingestion rates used were 0.10, 0.14, and 0.20 kg/day for children aged 0-5 years, 5-9 years, and adults 18-27 years, respectively, under the average scenario. Under the RME scenario, ingestion rates were assumed to be 0.10, 0.15, 0.18, 0.20, and 0.23 kg/day for children aged 0-5 years, 5-11 years, 11-18 years, adults 18-30 years, and adults 18-48 years, respectively (*EPA, 1990a*).

- It was assumed that, under the average scenario, ingestion of homegrown fruits would make up 20% of the total fruit consumption and 50% under the RME. It was assumed that, under the average scenario, ingestion of homegrown vegetables would make up 20% of the total vegetable consumption and 50% under the RME scenario (*EPA, 1990a*)

- All other assumptions were previously defined.

<u>Post-Construction Scenario</u>

- The same intake assumptions presented above for pre-construction onsite residents for dermal contact, ingestion and inhalation exposures were assumed for post-construction onsite residents.

Using the assumptions stated above and as presented in Tables 4-12a through 4-23, the estimated intakes for inhalation, ingestion and dermal contact ingestion exposures were calculated using Equations H-1, H-2 and H-3, as presented below:

Inhalation

$$CDI_n = \frac{CA \times PAF \times ET \times EF \times ED \times InR}{BW \times AT} \qquad \text{(Equation H-1)}$$

Ingestion

$$CDI_n = \frac{CS \times OAF \times EF \times ED \times IR \times CF}{BW \times AT} \qquad \text{(Equation H-2)}$$

Dermal Contact

$$CDI_n = \frac{CS \times DAF \times EF \times ED \times CF \times SA \times AF}{BW \times AT} \qquad \text{(Equation H-3)}$$

where:

CDI_n = Estimated intake for noncarcinogenic chemicals (mg/kg-day)

CA = Chemical concentration in air (mg/m^3)

PAF = Pulmonary absorption factor (%)

ET = Exposure time (hrs/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

InR = Inhalation rate (m^3/day)

CS = Chemical concentration in soil (mg/kg)

OAF = Oral absorption factor (%)

IR = Ingestion rate (mg/day)

CF = Conversion factor (1×10^{-6} kg/mg)

DAF = Chemical absorption factor (%)

SA = Skin surface area (cm^2)

AF = Adherence factor (mg/m^2/day)

BW = Body weight (kg)

AT = Averaging time for noncarcinogenic effects; 365 days multiplied by ED (above).

If the ED was equal to 1 year, the CDI was referred to as a subchronic daily intake (EPA, 1989b) to evaluate short-term exposures. All CA and CS exposure point concentrations are presented in Tables 4-9 through 4-11. The averaging time for noncarcinogenic risks is used to average the chemical intake over the time period exposure is expected to occur and is based on the ED assumed for the pathway under evaluation (e.g., 9 years or 30 years; EPA, 1989b).

1.1.2 Toxicity Values

To evaluate noncarcinogenic adverse health effects, EPA critical toxicity values were used (i.e., reference dose for chronic exposures [RfD_c]) and subchronic exposures [RfD_s]. An RfD_c is a chemical-specific, exposure-specific (e.g., ingestion, inhalation) dose (the CDI) to which nearly all populations may be exposed for a period of up to 365 days/year for 70 years without experiencing adverse health effects (*EPA. 1989b*). An RfD_s is for evaluating short-term exposures using the SDI. The toxicity values used in this assessment are presented in Table 4-5b. The oral toxicity values were used to evaluate the dermal pathway of exposure (*EPA. 1989b*).

1.1.3 Quantification Methods

Noncarcinogenic chemical intakes (doses) were estimated and compared to the chemical-specific RfDc's presented in Tables 4-5b. A ratio of the dose to RfDc was calculated to derive a hazard quotient (HQ) as shown below:

$$HQ_{i,\ route} = \frac{CDI_{n,\ route}}{RfD_{c\ i,\ route}} \text{ or } \frac{SDI_{n,\ route}}{RfD_{s,\ route}} \qquad \text{(Equation H-4)}$$

where:

$HQ_{i,\ route}$ = Hazard quotient; ratio of estimated dose to reference dose (unitless)

$CDI_{n, route}$ = Estimated chronic intake for noncarcinogenic chemical i (mg/kg/day)

$SDI_{n, route}$ = Estimated subchronic intake for noncarcinogenic chemical i (mg/kg/day)

$RfDc_{i, route}$ = Chronic reference dose for chemical i (mg/kg/day)

$RfD_{s, route}$ = Subchronic reference dose for chemical i (mg/kg/day)

Multiple chemical exposures were evaluated by summing the HQs for all chemicals for each route of exposure to derive a hazard index (HI) using the following equation:

$$HI_{i, route} = \text{Sum Total } HQs_{i, route} = \sum_{i=1}^{n} HQ_{i, route} \qquad \text{(Equation H-5)}$$

where:

$HI_{i, route}$ = Hazard index; sum total of (unitless)

$HQ_{i, route}$ = As defined in Equation H-4.

All estimated HIs were compared to an acceptable value of unity (1.0; EPA, 1989b). According to the EPA, if the HQ for a single chemical or combination of chemicals exceeds unity (1.0), there may be concern for potential chronic adverse health effects from the chemical exposures.

1.2 Carcinogenic Health Risks

The following sections discuss the calculation of the dose estimates for evaluating potential carcinogenic risks from exposures to the potentially carcinogenic COCs for the pathways discussed in Section ~~1.1~~.1.

1.2.1 Intake Assumptions

The intake assumptions described in Section 1.1.1 of this Appendix and Equations H-1, H-2, and H-3 were used to calculate a separate CDI for carcinogenic health risks (CDI_c) except that an averaging time (AT) used to calculate the CDI_c was based on 70 years multiplied by 365 days/year (*EPA, 1989b*).

1.2.2 Toxicity Values

The EPA has established carcinogenic slope factors (SFs) for most chemicals classified as potential or known carcinogens. The SF is a route-specific relative (carcinogenic) "potency" of a chemical, and is generally based on laboratory animal or human epidemiological studies. The federal and state EPA-established SF values used in risk characterizations for inhalation and oral routes of exposure are presented in Table 4-5b. The oral toxicity values were used to evaluate the dermal route of exposure (*EPA, 1989b*).

1.2.3 Quantification Methods

The dose (CDI_c) estimated for each potentially carcinogenic chemical represents the estimated amount of chemical taken into the body, and is used to calculate a carcinogenic risk as follows:

$$CR = CDI_c \times SF \qquad \text{(Equation H-6)}$$

where:

CR = Upperbound excess lifetime carcinogenic risks (unitless)

CDI_c = Estimated intake for carcinogenic chemicals (mg/kg-day)

SF = Slope factor $(mg/kg\text{-}day)^{-1}$.

Additionally, the estimated carcinogenic risks for all COCs were summed similarly to Equation H-3.

The calculated excess carcinogenic risks using Equation H-6 were compared to the "acceptable" risk range established by the Cal-EPA (i.e., 10^{-5} [1-chance-in-100,000 exposed individuals developing cancer]) to evaluate whether excess risks may occur from the projected exposures at the site.

The results of calculations from this assessment based on these methods are presented in Tables 4-27 to 4-44 (Section 4.0). These results are summarized in Tables 4-24 through 4-26.

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR), 1988. *Toxicological Profile for Lead.* Draft. U.S. Public Health Service. February.

Hawley, J.R., 1986. *Assessment of Health Risks from Contaminated Soil.* Risk Analysis 5(4); 289-302.

U.S. Environmental Protection Agency (EPA), 1989a. *Region 1, Supplemental Risk Assessment Guidance for the Superfund Draft.* June.

_______, 1989b. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part A), Interim Final.* EPA 540/1-89-002. December.

_______, 1990a. *Exposure Factors Handbook.* Office of Health and Environmental, EPA/60018-89/043. July.

_______, 1990b. *National Oil and Hazardous Substances Pollution Central Contingency Plan, Final Rule.* Fed. Reg. 55:8666-8865. March 8.

_______, 1991a. *Risk Assessment. Guidance for Superfund (RAGS) Supplement.* Waste and Emergency Response (OS-230). March.

_______, 1991b. *Interim Guidance for Dermal Exposure Assessment.* Office of Emergency and Remedial Response (OS-230). March.

_______, 1991c. *Risk Assessment Guidance for Superfund; Volume 1-Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals).* Interim. December.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Appendix I

RISK CHARACTERIZATION METHODOLOGY FOR INORGANIC LEAD

LIST OF TABLES

Table I-1 Results of UBK Model - Offsite Child/Adult Residents - During Construction Scenario - Average and RME Soil Concentration

Table I-2 Results of Leadspread Model - Offsite Adult Residents - During Construction Scenario - Average and RME Soil Concentration

Table I-3 Results of Leadspread Model - Adult Construction Workers - During Construction Scenario - Average and RME Soil Concentration

Table I-4 Summary of Lead Results from Multipathway Exposures, During Construction Scenario

1.0 TOXICITY OF LEAD

The following lead analysis was conducted for during construction exposure scenarios including onsite construction workers, offsite residents, and offsite workers. The same methods outlined below were used to establish health based screening levels (tHBLs) of 200 mg/kg, 1000 mg/kg, and 2000 mg/kg for construction workers, resident children and adults, respectively (Table 4-2). These tHBLs are conservative screening values which exposure point concentrations can be compared to in order to evaluate whether lead exposures may present a health hazard. Further details are presented below.

Inorganic lead is a COC at the 1009 Mission Street site. This appendix describes the methods and results for evaluating inorganic lead concentrations detected in soil; these methods are different from those used for other COCs since quantitative toxicity criteria (i.e., SFs and RfDs, Tables 4-5a and 4-5b) have not been established by either federal EPA or California EPA for inorganic lead. EPA has stated that these criteria are not applicable to inorganic lead because of incomplete knowledge of the complex physiological dynamics of lead in the body (*EPA, 1992*). Therefore, alternative methods have been developed to evaluate potential toxicity to inorganic lead. These methods are based on establishing a target blood-lead level that is not expected to result in toxicity.

The target level approach developed for evaluating lead is considered appropriate because toxicity effects are typically observed for inorganic lead above a certain blood-lead level. Exposure-route-specific (e.g., ingestion, inhalation) blood-lead slope factors have been developed for inorganic lead that relate daily exposure to lead in micrograms per day (μg/day) with resulting increase in blood-lead levels in units of micrograms of lead per deciliter of blood (μg/dl).

While blood-lead concentrations are generally accepted as the best measure of the external dose of lead (*NAS, 1980*), the threshold level below which no toxicity is expected has been the subject of considerable scrutiny. The most serious effects associated with elevated blood-lead levels are neurotoxic effects. For adults, such damage typically does not occur until blood-lead levels exceed 100 to 120 μg/dl. However, other observable effects of elevated blood-lead levels occur at levels as low as 15 to 30 μg/dl (elevation of the enzyme erythrocyte protoporphyrin; *EPA, 1986*). Increased blood pressure has also been suggested to be due to blood-lead levels as low as 7 to 10 μg/dl in white males aged 40 to 59 (*EPA, 1986*). Neurological impairment (e.g., effects on IQ) have been seen in children at similar blood-lead levels. Some recent data suggest that no threshold for lead toxicity may exist (*ATSDR, 1990*).

1.1 Acceptable Target Blood-Lead Level

Based on the data presented above, the EPA and DTSC have established a blood-lead level of 10 μg/dl as an acceptable target below which no adverse effects are expected (e.g., a no observed adverse effect level [NOAEL]). Because this is a mean target concentration for the population as a whole, it is expected to be protective of only 50 percent of the population. It is desirable to establish a target level that is protective of the great majority of the population. For example, EPA carcinogenic SFs are based on the upper 95 percent confidence limit of the mean of the linearized multi-stage model (*EPA, 1989*).

The EPA considers a blood-lead level protective of 95 percent of the population to be acceptable (*EPA, 1990*); DTSC requests that 99 percent of the population be protected (*DTSC, 1992*). Because blood-lead levels have been shown to be geometrically distributed in the United States with a geometric standard deviation of 1.42, the blood-

lead level that is expected to be protective of 95 percent of the population (based on a mean target level of 10 μg/dl) is 5.68 μg/dl.

2.0 EXPOSURE MODELS

Two exposure models were used to estimate risks from inorganic lead, one each for children and adults. This models are described below.

2.1 EPA UBK Model

For children, the EPA has developed an Uptake/Biokinetic Model (UBK; *EPA, 1990*) for lead that provides a method to predict blood-lead levels in children, ages 0 through 6. It accounts for exposures to lead in air, diet, drinking water, soil, indoor dust, and paint. The relative contribution of each medium on the total blood-lead level can be estimated using this model, and the amount due to site-related lead exposures can be evaluated relative to other background exposures. This is a complex, physiologically-based pharmacokinetic model that attempts to accurately distribute absorbed lead into the various compartments of the body, including the blood.

The UBK lead program is designed to accept user input of variables pertaining to site-specific exposures to lead through air, diet, water, soil, dust, and paint. The user can select either a linear or nonlinear "active-passive" absorption model to calculate uptake from diet, soil, water, or paint. The model recommends using the nonlinear absorption model when either intake to the GI tract exceeds 100 μg/day or when soil lead concentrations exceed 1000 mg/kg. A preliminary version of the EPA Fetal Model (*EPA, 1990*) has been incorporated into this program to estimate blood-lead levels in newborns based on maternal uptake and biokinetics.

All model default intake assumptions and parameters were used for each of the child residential scenarios evaluated, except where noted below (Section 3.0). Nondefault intake assumptions and parameters were used to maintain consistency with those used to evaluate potential human health risks due to exposure to other COCs.

Both average and RME scenarios were evaluated for lead exposure. For the average scenario, the arithmetic mean soil lead concentration (Table 4-1) was used. For the RME scenario, the lesser of the maximum and 95 percent UCL of the arithmetic mean detected concentration was used (Table 4-1).

2.2 DTSC Leadspread Model

Because the UBK model only applies to children under the age of 7, adult exposures to lead were evaluated using the Lotus spreadsheet "Leadspread" developed and approved by DTSC (*1992*). Leadspread relates daily lead exposures via air, water, food, and soil to blood-lead levels by use of pathway-specific SFs.

The Leadspread model is designed to use default intake values for exposure pathways, and user-supplied concentrations for lead in air, water, soil, and homegrown produce (if applicable). The model then calculates resulting blood-lead levels that correspond to the mean, 95th, and 99th percentiles of the general population. Because the model calculates a mean blood-lead concentration and then statistically extrapolates that to 95th and 99th percent confidence limits, the model is only accurate when average intake assumptions are used (*DTSC, 1992*). Therefore, the intake assumptions used for adults (both residents and workers) are based on the average scenarios discussed in Appendix H and presented in Tables 4-8 to 4-18. More details are presented below.

3.0 EXPOSURE ASSUMPTIONS

3.1 UBK Model

Non-default assumptions were used for children to represent time outdoors (2 hours), percent of outdoor air lead concentration in indoor air (75%), and water consumption (0.68 l/day); for inhalation rates, the default value (4.4 m^3/day) is a conservative estimate of what the actual breathing rate for children aged 0-7 is likely to be. These intake assumptions in all cases are identical to those used to estimate 0 through 5 year old child resident exposures for all other COCs (Tables 4-14 to 4-18). These and other intake assumptions used as input to the model are presented in Table I-1

3.2 Leadspread Model

As presented in Section 4.3, three different adult receptor populations were evaluated for this site: they are hypothetical construction workers, offsite office workers, and future offsite residents. For the purposes of the lead assessment, offsite residents were considered representative of offsite workers, therefore, offsite workers were not evaluated. For each of these adult receptors, the average intake assumptions presented in Tables 4-8 to 4-18 in were used. In the case of the adult construction worker for soil, either the maximum detected surface or subsurface concentration was used, whichever was greater. This assumption is conservative, because the construction worker is assumed to be exposed to the whole soil column at the given maximum soil concentration for surface soil, or subsurface soil, depending on the site.

The default soil ingestion rate of 25 mg/day assumed by the model is lower than the 100 mg/day used for adult residents; this may result in artificially elevated blood-lead levels (i.e., overly conservative) but is consistent with the screening nature of the

assessment. In addition, the default soil ingestion rate of 25 mg/day assumed by the model is lower than the 50 mg/day used for adult office workers; this may also result in artificially elevated blood-lead levels (i.e., overly conservative) but is consistent with the screening nature of the assessment.

The default soil ingestion rate of 25 mg/day assumed by the model for construction workers is much lower than the ingestion rate of 480 mg/day; this may result in greatly elevated and inaccurate blood-lead levels (i.e., overly conservative) but, again, is consistent with the screening nature of the assessment.

The air concentrations of lead sorbed to suspended dusts calculated by applying modeling methods described in Appendix E and F were used to estimate blood lead levels. Additionally, concentrations of lead in soil deposited at offsite locations determined by applying the methods described in Appendices E and F, were used in these lead models.

The exposure point concentrations presented in Appendix G, fruit and vegetable uptake, were used in the UBK model to estimate the contribution from ingestion of homegrown produce. This was done by adding the concentrations of lead in fruits for an RME scenario (Table G-1) with the concentration in vegetables for an RME scenario (Table 3) to the default lead in food concentrations used by the model. The leadspread model directly estimates the dose an individual receives from ingesting food containing various concentrations of lead. Therefore, the results from Appendix G were not used for leadspread.

4.0 RISK CHARACTERIZATION

The following section discusses the results of the lead exposure modeling scenarios evaluated for the Mission Street site. Because both models provide one blood-

lead level resulting from multi-pathway exposure, this discussion focuses on identifying populations with estimated blood-lead levels in excess of those recommended as "safe". For each of these populations, the media contributing the majority of exposures are then delineated. For onsite construction workers, lead concentrations were estimated according to the methods described in Appendix E; 2.07 $\mu g/m^3$ in air and 2,907 mg/kg in surface soil were used for the average scenario and 8.91 $\mu g/m^3$ in air and 12,499 mg/kg in soil were used for the RME scenario. Based on the intake assumptions and exposure point concentrations used for the Mission Street site, onsite construction workers are expected to be at substantial risk from exposure to lead, with estimated 95th percentile target blood-lead levels ranging from 51.26 (average scenario) to 215.25 $\mu g/dl$ (RME scenario). Between 97 and 99 percent of this exposure is due to lead in soil, with lead in food accounting for only 1 to 3 percent of the total exposure.

For offsite residents, lead concentrations of 0.632 $\mu g/m^3$ in air and 3.22 mg/kg in surface soil were used for the average scenario and 2.72 $\mu g/m^3$ in air and 13.86 mg/kg in surface soil for the RME scenario. Based on the intake assumptions and exposure point concentrations used for the Mission Street site, exposure to offsite adult residents and children are expected to result in acceptable blood-lead levels (95th percentile blood-lead levels for average and RME scenarios of 3.34 to 9.49 and 1.55 to 1.90 $\mu g/dl$, respectively; (Tables 1-2 and 1-3).

In conclusion, risks due to lead exposure from the Mission Street site are primarily indicated for onsite construction workers from ingestion of soil. For construction workers, exposures are expected to result in elevated blood-lead levels (95th percentile blood-lead level of 215 $\mu g/dl$). The high assumed ingestion rate of

480 mg/day may result in artificially elevated blood-lead levels; therefore, this estimated blood-lead level of 215 μg/dl may not reflect actual levels.

REFERENCES

Agency for Toxic Substances and Disease Registry, 1990. *Toxicological Profile for Lead*. U.S. Public Health Service. June.

California Department of Health Services (DHS/DTSC), 1992. *Guidance for Site Characterization and Multimedia Risk Assessments for Hazardous Substance Release Sites Volume 6, Chapter 5, Assessment of Health Risks from Inorganic Lead in Soils. Review Draft.* Sacramento, California. January.

California Health and Welfare Agency (HWA), 1990. *Users Guide for Lead.* A PC Software Application of the Uptake/Biokinetic Model Version 0.40. Prepared by Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment. Draft. September.

NAS, 1980. *Lead in the Human Environment.* Committee of Lead in the Human Environment. National Academy of Sciences, Washington, D.C.

U.S. Environmental Protection Agency, (EPA), 1986. *Air Quality Criteria for Lead.* Volumes 1-4. Office of Research and Development. EPA/600/8-83/028 a-dF.

U.S. Environmental Protection Agency, 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation (Part A). Interim Final.* EPA 540/1-89/002. December.

U.S. Environmental Protection Agency, 1992. *Integrated Risk Information System (IRIS).* Online database. Updated through May 31, 1992.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

TABLES

Table I–1. Results of UBK Model – Offsite Child/Adult Residents During Construction Scenario – Average Soil Concentrations
1009 Mission Street
San Francisco Redevelopment Agency

ABSORPTION METHODOLOGY: Non–Linear Active–Passive

AIR CONCENTRATION: 0.632 μg Lead/m³

Indoor AIR Lead Concentration: 0.8 percent of outdoor

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m³/day)	Lung Absorp. (%)
0–1	2.0	4.4	32.0
1–2	2.0	4.4	32.0
2–3	2.0	4.4	32.0
3–4	2.0	4.4	32.0
4–5	2.0	4.4	32.0
5–6	2.0	4.4	32.0
6–7	2.0	4.4	32.0

DIET: Daily Lead consumption by year as follows:

0–1	6.07	μg Pb/day
1–2	6.11	μg Pb/day
2–3	6.98	μg Pb/day
3–4	6.76	μg Pb/day
4–5	6.55	μg Pb/day
5–6	6.94	μg Pb/day
6–7	7.67	μg Pb/day

DRINKING WATER CONCENTRATION: 0.00 μg Lead/l

Other WATER Parameters (non–default):

Age	Water Consumption (L/day)
0–1	0.68
1–2	0.68
2–3	0.68
3–4	0.68
4–5	0.68
5–6	0.68
6–7	0.68

SOIL & DUST:

Soil: Constant Concentration
Dust: Constant Concentration

Age	Soil (μg Lead/g)	House Dust (μg Lead/g)
0–1	3.2	3.2
1–2	3.2	3.2
2–3	3.2	3.2
3–4	3.2	3.2
4–5	3.2	3.2
5–6	3.2	3.2
6–7	3.2	3.2

Additional Dust Sources: None DEFAULT

Table I-1. Results of UBK Model - Offsite Child/Adult Residents During Construction Scenario - Average Soil Concentrations 1009 Mission Street San Francisco Redevelopment Agency

PAINT INTAKE: 0.00 μg Lead/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Concentration: 7.50 μg Lead/dl

CALCULATED BLOOD Lead and Lead UPTAKES:

Year	Blood Level (μg/dl)	Total Uptake (μg/dl)	Soil/Dust Uptake (μg/dl)
0.5-1	1.55	3.31	0.19
1-2	1.10	3.33	0.19
2-3	1.05	3.76	0.19
3-4	1.07	3.65	0.19
4-5	1.08	3.55	0.19
5-6	1.09	3.74	0.19
6-7	1.14	4.11	0.19

Year	Diet Uptake (μg/dl)	Water Uptake (μg/dl)	Paint Uptake (μg/dl)	Air Uptake (μg/dl)
0.5-1	3.03	0.00	0.00	0.08
1-2	3.05	0.00	0.00	0.08
2-3	3.49	0.00	0.00	0.08
3-4	3.38	0.00	0.00	0.08
4-5	3.27	0.00	0.00	0.08
5-6	3.47	0.00	0.00	0.08
6-7	3.83	0.00	0.00	0.08

1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons

Table I–1. Results of UBK Model – Offsite Child/Adult Residents During Construction Scenario – RME Soil Concentrations 1009 Mission Street San Francisco Redevelopment Agency

ABSORPTION METHODOLOGY: Linear Absorption

AIR CONCENTRATION: 2.716 μg Lead/m^3

Indoor AIR Lead Concentration: 0.8 percent of outdoor

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m^3/day)	Lung Absorp. (%)
0–1	2.0	4.4	32.0
1–2	2.0	4.4	32.0
2–3	2.0	4.4	32.0
3–4	2.0	4.4	32.0
4–5	2.0	4.4	32.0
5–6	2.0	4.4	32.0
6–7	2.0	4.4	32.0

DIET: Daily Lead consumption by year as follows:

0–1	6.67	μg Pb/day
1–2	6.71	μg Pb/day
2–3	7.58	μg Pb/day
3–4	7.36	μg Pb/day
4–5	7.15	μg Pb/day
5–6	7.54	μg Pb/day
6–7	8.27	μg Pb/day

DRINKING WATER CONCENTRATION: 0.00 μg Lead/l

Other WATER Parameters (non–default):

Age	Water Consumption (L/day)
0–1	0.68
1–2	0.68
2–3	0.68
3–4	0.68
4–5	0.68
5–6	0.68
6–7	0.68

SOIL & DUST:

Soil: Constant Concentration
Dust: Constant Concentration

Age	Soil (μg Lead/g)	House Dust (μg Lead/g)
0–1	13.9	13.9
1–2	13.9	13.9
2–3	13.9	13.9
3–4	13.9	13.9
4–5	13.9	13.9
5–6	13.9	13.9
6–7	13.9	13.9

Additional Dust Sources: None DEFAULT

TABLE I–2. Results of Leadspread Model – Offsite Adult Residents During Construction Scenario – Average Soil Concentrations

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.632	BLOOD Lead, ADULT (µg/dl)	1.88	3.34	4.3
LEAD IN SOIL (µg/g) /b/	3.224				
LEAD IN WATER (µg/l)	0				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	1				

EQUATIONS, ADULTS

Blood Lead Pathway	µg/dl		Route-specific constant			Concentration in medium		Contact rate	Percent of total
SOIL CONTACT:	0.00	=	1E-04	(µg/dl)/(µg/day)	*	3 µg/g	*	0.2287 g soil/day (0.1 g/m² * 0.2287 m²)	0%
SOIL INGESTION:	0.01	=	0.018	(µg/dl)/(µg/day)	*	3 µg/g	*	0.1 g soil/day	0%
INHALATION:	1.04	=	1.64	(µg/dl)/(µg/m³)	*	0.63 µg/m³			55%
WATER INGESTION:	0.00	=	0.04	(µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.84	=	0.04	(µg/dl)/(µg/day)	*	9.5 µg Pb/kg diet	*	2.2 kg diet/day	45%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Lead in produce (µg/kg) = 9.5 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 1.5 µg/kg

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

Table I–1. Results of UBK Model – Offsite Child/Adult Residents
During Construction Scenario – RME Soil Concentrations
1009 Mission Street
San Francisco Redevelopment Agency

PAINT INTAKE: 0.00 μg Lead/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Concentration: 7.50 μg Lead/dl

CALCULATED BLOOD Lead and Lead UPTAKES:

Year	Blood Level (μg/dl)	Total Uptake (μg/dl)	Soil/Dust Uptake (μg/dl)
0.5–1	1.90	4.51	0.83
1–2	1.46	4.53	0.83
2–3	1.40	4.97	0.83
3–4	1.42	4.86	0.83
4–5	1.44	4.75	0.83
5–6	1.45	4.95	0.83
6–7	1.49	5.31	0.83

Year	Diet Uptake (μg/dl)	Water Uptake (μg/dl)	Paint Uptake (μg/dl)	Air Uptake (μg/dl)
0.5–1	3.33	0.00	0.00	0.35
1–2	3.35	0.00	0.00	0.35
2–3	3.79	0.00	0.00	0.35
3–4	3.68	0.00	0.00	0.35
4–5	3.57	0.00	0.00	0.35
5–6	3.77	0.00	0.00	0.35
6–7	4.13	0.00	0.00	0.35

TABLE I–3. Results of Leadspread Model – Adult Construction Workers During Construction Scenario – Average Soil Concentrations

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	2.07	BLOOD Lead, ADULT (µg/dl)	28.84	51.26	65.3
LEAD IN SOIL (µg/g) /b/	2907				
LEAD IN WATER (µg/l)	0				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Lead Pathway	µg/dl		Route-specific constant		Concentration in medium		Contact rate	Percent of total
SOIL CONTACT:	0.01	=	1E-04 (µg/dl)/(µg/day)	*	2907 µg/g	*	0.2287 g soil/day (0.1 g/m² * 0.2287 m²)	0%
SOIL INGESTION:	24.56	=	0.018 (µg/dl)/(µg/day)	*	2907 µg/g	*	0.48 g soil/day	85%
INHALATION:	3.39	=	1.64 (µg/dl)/(µg/m³)	*	2.07 µg/m³			12%
WATER INGESTION:	0.00	=	0.04 (µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.88	=	0.04 (µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	3%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Lead in produce (µg/kg) = 10.0 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 10.0 µg/kg

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

TABLE I-2. Results of Leadspread Model – Offsite Adult Residents During Construction Scenario – RME Soil Concentrations

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR ($\mu g/m^3$)	2.716	BLOOD Lead, ADULT ($\mu g/dl$)	5.34	9.49	12.1
LEAD IN SOIL ($\mu g/g$) /b/	13.86				
LEAD IN WATER ($\mu g/l$)	0				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	1				

EQUATIONS, ADULTS

Blood Lead Pathway	$\mu g/dl$	Route-specific constant		Concentration in medium		Contact rate	Percent of total
SOIL CONTACT:	0.00 =	1E-04 (µg/dl)/(µg/day)	*	14 µg/g	*	0.2287 g soil/day (0.1 g/m² * 0.2287 m²)	0%
SOIL INGESTION:	0.02 =	0.018 (µg/dl)/(µg/day)	*	14 µg/g	*	0.1 g soil/day	1%
INHALATION:	4.45 =	1.64 (µg/dl)/(µg/m³)	*	2.72 µg/m³			83%
WATER INGESTION:	0.00 =	0.04 (µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.86 =	0.04 (µg/dl)/(µg/day)	*	9.8 µg Pb/kg diet	*	2.2 kg diet/day	16%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Lead in produce (µg/kg) = 9.8 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 6.2 µg/kg

/a/ Source: DTSC, 1992

/b/ Used as a preliminary remediation goal (PRG).

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

TABLE I–3. Results of Leadspread Model – Adult Construction Workers During Construction Scenario – RME Soil Concentrations

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR ($\mu g/m^3$)	8.91	BLOOD Lead, ADULT ($\mu g/dl$)	121.11	215.25	274.2
LEAD IN SOIL ($\mu g/g$) /b/	12499				
LEAD IN WATER ($\mu g/l$)	0				
SITE–GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Lead Pathway	$\mu g/dl$		Route specific constant		Concentration in medium		Contact rate	Percent of total
SOIL CONTACT:	0.03	=	1E–04 ($\mu g/dl$)/($\mu g/day$)	*	12499 $\mu g/g$	*	0.2287 g soil/day (0.1 g/m^2 * 0.2287 m^2)	0%
SOIL INGESTION:	105.59	=	0.018 ($\mu g/dl$)/($\mu g/day$)	*	12499 $\mu g/g$	*	0.48 g soil/day	87%
INHALATION:	14.61	=	1.64 ($\mu g/dl$)/($\mu g/m^3$)	*	8.91 $\mu g/m^3$			12%
WATER INGESTION:	0.00	=	0.04 ($\mu g/dl$)/($\mu g/day$)	*	15 $\mu g/l$	*	1.4 l water/day	0%
FOOD INGESTION:	0.88	=	0.04 ($\mu g/dl$)/($\mu g/day$)	*	10.0 μg Pb/kg diet	*	2.2 kg diet/day	1%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Lead in produce ($\mu g/kg$) = 10.0 $\mu g/kg$

LEAD IN PRODUCE = 10 $\mu g/kg$ or 0.00045 * soil lead = 10.0 $\mu g/kg$

/a/ Source: DTSC, 1992

/b/ Used as a preliminary remediation goal (PRG).

Table I–4. Summary of Lead Results from Multipathway Exposures /a/ During Construction Scenario 1009 Mission Street San Francisco Redevelopment Agency

Receptor Populations	Average Scenario Model–Estimated Blood–Lead Level (µg/dl)	HR	RME Scenario Model–Estimated Blood–Lead Level (µg/dl)	HR
Construction Worker	51.26	9.0	215.25	21.5
Child Resident	1.55	0.3	1.90	0.3
Adult Resident	3.34	0.6	9.49	0.9

Dashes (– –) denote not calculable

HR = Hazard Ratio; calculated as the quotient of the model–estimated blood–lead level divided by the target blood–lead level of 5.68 µg/dl (for children) or 10 µg/dl (for adults); see Appendix I for additional discussion.

µg/dl = micrograms per deciliter

/a/ Exposure pathways included inhalation of dust, ingestion of soil, dermal contact with soil, and ingestion of fruits and vegetables (residents only).

Appendix J

COMPARISON OF EXPOSURES TO NO SIGNIFICANT RISK LEVELS

LIST OF TABLES

Table J-1 Comparison of Average Daily Doses (μg/day) of COCs with proposition 65 No Significant Risk Levels (NSRLs) - During Construction Scenario

The State of California has implemented Proposition 65. Under Proposition 65 requirements, a "clear and reasonable warning" to potential receptor populations is necessary if carcinogens or reproductive toxins are known to be present at a site, and if exposures above Proposition 65 No Significant Risk Levels (NSRLs) are anticipated. In the case of a carcinogen, a NSRL is a regulatory level calculated by the State to result in no more than one excess case of cancer in an exposed population of 100,000. In the case of a reproductive toxin, a NSRL is a dose of a chemical equal to the no observed adverse affect level (NOAEL; the highest experimental dose at which there was no statistically significant change in a toxicologically significant endpoint) divided by a safety factor of 1,000. Proposition 65 lists arsenic, chromium VI and B(a)P as carcinogens and lead as a reproductive toxin (HWA 1988, updated 1991). Because arsenic, chromium VI, B(a)P and lead are listed under Proposition 65, it was necessary to compare the estimated doses of arsenic, chromium VI, B(a)P and lead to the Proposition 65 NSRL values of 10, 0.001, 0.06, and 0.5 μg/day, respectively. However, for the purposes of this report. the Proposition 65 evaluation was not performed for lead since a thorough evaluation was performed in Appendix I and the lead NSRL probably does not reflect current research on acceptable blood lead levels.

To compare a calculated lifetime dose to a NSRL, it was necessary to calculate the doses in micrograms per day (μg/day) to which an individual would be exposed over a lifetime. Estimates of lifetime doses are calculated as follows:

$$\text{Lifetime Dose } (\mu\text{g/day}) = CDI_c \times BW \times 10^3 \qquad \text{(Equation J-1)}$$

where:

CDI_c = Estimated intake for carcinogenic chemical

BW = 70 kg (adult)

10^3 = Conversion factor; unit conversion from mg to μg.

The sum total lifetime doses (μg/day) for arsenic, chromium VI, and B(a)P for the onsite construction worker were estimated based on the results of the risk characterization presented in Tables 4-19 to 4-21. Table J-1 shows that the lifetime doses exceed the NSRL for chromium VI, primarily due to ingestion of soil. However, since these results are based on an RME scenario, and since 100% of the chromium detected at the site was assumed to be of the more potent chromium VI form, these results are probably unrealistically high. This Proposition 65 evaluation was not performed for the other offsite receptors because the construction worker represents the highest health risks. Based on this evaluation, a clear and reasonable warning to receptor populations of concern may be required for chromium.

REFERENCES

California Health and Welfare Agency (HWA), 1988. *Safe Drinking Water and Toxic Enforcement Act of 1986.* California Code of Regulations, Division 2, Chapter 3, Article 8, Section 2711, Updated 1991.

TABLES

Table J-1. Comparison of Average Daily Doses (µg/day) of COCs with Proposition 65 No Significant Risk Levels (NSRLs) During Construction Scenario 1009 Mission Street San Francisco Redevelopment Agency

Chemical	Exposure Pathway	CDIc /a/ (mg/kg/day)	µg/day (CDIc x 1000 x 70)	NSRL
Arsenic	Dermal	3.99E-09	2.79E-04	1.00E+00
	Ingestion	3.37E-06	2.36E-01	1.00E+00
	Inhalation of dust from outside air	1.20E-07	8.40E-03	1.00E+00
	Sum	**3.49E-06**	**2.45E-01**	**1.00E+00**
Chromium VI	Dermal	1.56E-09	1.09E-04	1.00E-03
	Ingestion	1.32E-06	9.24E-02	1.00E-03
	Inhalation of dust from outside air	4.70E-08	3.29E-03	1.00E-03
	Sum	**1.37E-06**	**9.58E-02**	**[illegible].00E-03**
Benzo(a)pyrene	Dermal	6.83E-09	4.78E-04	6.00E-02
	Ingestion	3.84E-07	2.69E-02	6.00E-02
	Inhalation of dust from outside air	1.37E-08	9.59E-04	6.00E-02
	Sum	**4.05E-07**	**2.83E-02**	**6.00E-02**

/a/ CDIc's for onsite construction worker under RME scenario and indicated exposure pathways. From: Tables 4-19 through 4-21.

Note: For risk assessment purposes, values expressed in scientific notation.

Excerpts from "Site Assessment, 1009 Mission Street, San Francisco, California", Volumes I and II, Harding Lawsons Associates, June 28, 1993.

APPENDIX E

BLOOD LEAD SPREADSHEETS

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT

MEDIUM	LEVEL
LEAD IN AIR (ug/m^3)	0.03
LEAD IN SOIL (ug/g)	229
LEAD IN WATER (ug/l)	13
PLANT UPTAKE? 1=YES 0=NO	0
AIRBORNE DUST (ug/m^3)	50

OUTPUT

		percentiles 50th	90th	95th	98th	99th
BLOOD Pb, ADULT	(ug/dl)	1.8	2.9	3.2	3.7	4.1
BLOOD Pb, CHILD	(ug/dl)	3.9	6.1	7.0	8.0	8.9

EQUATIONS, ADULTS

Blood Pb Pathway	ug/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.04	=	1E-04 (ug/dl)/(ug/day)	*	229 ug/g	*	1.85 g soil/day (5 g/m^2 * 0.37 m^2)	2%
SOIL INGESTION:	0.10	=	0.018 (ug/dl)/(ug/day)	*	229 ug/g	*	0.025 g soil/day	6%
INHALATION:	0.07	=	1.64 (ug/dl)/(ug/m^3)	*	0.04 ug/m^3			4%
WATER INGESTION:	0.73	=	0.04 (ug/dl)/(ug/day)	*	13 ug/l	*	1.4 l water/day	40%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	2.2 kg diet/day	48%

EQUATIONS, CHILDREN (TYPICAL)

Blood Pb Pathway	ug/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.03	=	1E-04 (ug/dl)/(ug/day)	*	229 ug/g	*	1.4 g soil/day (5 g/m^2 * 0.28 m^2)	1%
SOIL INGESTION:	0.89	=	0.070 (ug/dl)/(ug/day)	*	229 ug/g	*	0.06 g soil/day	23%
INHALATION:	0.08	=	1.92 (ug/dl)/(ug/m^3)	*	0.04 ug/m^3			2%
WATER INGESTION:	0.83	=	0.16 (ug/dl)/(ug/day)	*	13 ug/l	*	0.4 l water/day	21%
FOOD INGESTION:	2.08	=	0.16 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	1.3 kg diet/day	53%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0 .945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead d = 10.0 ug/kg

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT

MEDIUM	LEVEL
LEAD IN AIR (ug/m^3)	0.03
LEAD IN SOIL (ug/g)	462
LEAD IN WATER (ug/l)	13
PLANT UPTAKE? 1=YES 0=NO	0
AIRBORNE DUST (ug/m^3)	50

OUTPUT

		percentiles 50th	90th	95th	98th	99th
BLOOD Pb, ADULT	(ug/dl)	2.0	3.1	3.5	4.1	4.5
BLOOD Pb, CHILD	(ug/dl)	4.9	7.6	8.7	10.0	11.0

EQUATIONS, ADULTS

Blood Pb Pathway	ug/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.09	=	1E-04 (ug/dl)/(ug/day)	*	462 ug/g	*	1.85 g soil/day (5 g/m^2 * 0.37 m^2)	5%
SOIL INGESTION:	0.20	=	0.018 (ug/dl)/(ug/day)	*	462 ug/g	*	0.025 g soil/day	10%
INHALATION:	0.09	=	1.64 (ug/dl)/(ug/m^3)	*	0.05 ug/m^3			4%
WATER INGESTION:	0.73	=	0.04 (ug/dl)/(ug/day)	*	13 ug/l	*	1.4 l water/day	37%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	2.2 kg diet/day	44%

EQUATIONS, CHILDREN (TYPICAL)

Blood Pb Pathway	ug/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.07	=	1E-04 (ug/dl)/(ug/day)	*	462 ug/g	*	1.4 g soil/day (5 g/m^2 * 0.28 m^2)	1%
SOIL INGESTION:	1.79	=	0.070 (ug/dl)/(ug/day)	*	462 ug/g	*	0.06 g soil/day	37%
INHALATION:	0.10	=	1.92 (ug/dl)/(ug/m^3)	*	0.05 ug/m^3			2%
WATER INGESTION:	0.83	=	0.16 (ug/dl)/(ug/day)	*	13 ug/l	*	0.4 l water/day	17%
FOOD INGESTION:	2.08	=	0.16 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	1.3 kg diet/day	43%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0 .945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead d = 10.0 ug/kg

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT

MEDIUM	LEVEL
LEAD IN AIR (ug/m^3)	0.03
LEAD IN SOIL (ug/g)	1290
LEAD IN WATER (ug/l)	13
PLANT UPTAKE? 1=YES 0=NO	0
AIRBORNE DUST (ug/m^3)	50

OUTPUT

		percentiles				
		50th	90th	95th	98th	99th
BLOOD Pb, ADULT	(ug/dl)	2.6	4.0	4.6	5.3	5.8
BLOOD Pb, CHILD	(ug/dl)	8.3	13.0	14.7	17.0	18.7

EQUATIONS, ADULTS

Blood Pb Pathway	ug/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.25	=	1E-04 (ug/dl)/(ug/day)	*	1290 ug/g	*	1.85 g soil/day (5 g/m^2 * 0.37 m^2)	10%
SOIL INGESTION:	0.57	=	0.018 (ug/dl)/(ug/day)	*	1290 ug/g	*	0.025 g soil/day	22%
INHALATION:	0.15	=	1.64 (ug/dl)/(ug/m^3)	*	0.09 ug/m^3			6%
WATER INGESTION:	0.73	=	0.04 (ug/dl)/(ug/day)	*	13 ug/l	*	1.4 l water/day	28%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	2.2 kg diet/day	34%

EQUATIONS, CHILDREN (TYPICAL)

Blood Pb Pathway	ug/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.19	=	1E-04 (ug/dl)/(ug/day)	*	1290 ug/g	*	1.4 g soil/day (5 g/m^2 * 0.28 m^2)	2%
SOIL INGESTION:	4.99	=	0.070 (ug/dl)/(ug/day)	*	1290 ug/g	*	0.06 g soil/day	60%
INHALATION:	0.18	=	1.92 (ug/dl)/(ug/m^3)	*	0.09 ug/m^3			2%
WATER INGESTION:	0.83	=	0.16 (ug/dl)/(ug/day)	*	13 ug/l	*	0.4 l water/day	10%
FOOD INGESTION:	2.08	=	0.16 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	1.3 kg diet/day	25%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0 .945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead d = 10.0 ug/kg